3.8 Air Quality

3.8.1 Regulatory Setting

Air quality in Utah is regulated by U.S. Environmental Protection Agency (EPA) at the federal level and by the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), at the state level. Transportation-related emissions are forecasted by the two metropolitan planning organizations (MPOs) serving the region: the Wasatch Front Regional Council (WFRC) in Salt Lake County and the Mountainland Association of Governments (MAG) in Utah County.

3.8.1.1 Pollutants of Concern

Criteria Air Pollutants

Part of this assessment focuses on the "criteria air pollutants" for which the EPA has established national ambient air quality standards (NAAQS). Criteria air pollutants have the potential to cause health problems and are partially associated with transportation-related emissions: carbon monoxide (CO), particulate matter (PM), ozone (O_3), nitrogen oxides (NOx), and volatile organic compounds (VOCs). This assessment also considered lead (Pb) as a potential air pollutant of concern because of its potential to be re-suspended from lead-containing contaminated soil during construction activities. The specific concerns associated with these criteria air pollutants and their typical sources of emission are described below.

- CO, which is emitted by vehicle engines, reduces the amount of oxygen carried in the human bloodstream.
- PM falls into one of two categories: PM with a diameter of 10 microns or less (PM_{10}) and PM with a diameter of 2.5 microns or less ($PM_{2.5}$). $PM_{2.5}$ is part of PM_{10}, but the two are regulated independently. There are two categories of particulate emissions from mobile sources: primary and secondary.
- Primary particulate emissions are those emitted from vehicle tailpipes, brake wear, decomposition of rubber tires, and road dust stirred up by moving vehicles.
- Secondary particulate emissions result from chemical reactions in the atmosphere involving oxides of sulfur (SO_x) and NOx emitted from vehicle tailpipes as gaseous pollutants.
- Ozone is a secondary pollutant formed when precursor emissions of NOx and VOCs react in the presence of sunlight. O_3 is a major component of photochemical smog.
- NOx is composed mainly of nitric oxide (NO) and nitrogen dioxide (NO_2). NO is formed in high-temperature combustion processes, such as within internal combustion engines. When NO reaches the atmosphere, most of it oxidizes and produces NO_2, the brownish component of photochemical smog.
- VOCs, the reactive component of hydrocarbon emissions, are compounds of carbon and hydrogen that react chemically in the atmosphere to produce NO_2 and O_3. Principal sources of VOCs are vehicle exhaust emissions and the evaporation of gasoline from fuel tanks, fuel injectors, and carburetors.
- Sulfur dioxide (SO_2) is a combustion product formed from sulfur in the fossil fuels used by construction equipment and by vehicles traveling along roadways. High airborne concentrations of SO_2 can cause respiratory problems. SO_2 emissions from construction equipment and vehicles are expected to steadily decrease in the future as a result of EPA's nationwide restrictions on sulfur content in fuel.
- Lead can be released during construction from contaminated soils that contain historic lead deposits (i.e., from periods before lead was phased out of gasoline). High airborne concentrations of lead can cause a range of health effects (especially in children), including behavioral problems and learning disabilities.

Mobile-Source Air Toxics

The federal Clean Air Act (CAA) identified 188 air toxics, also known as hazardous air pollutants. Most air toxics originate from human-generated sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries). The EPA has assessed this expansive list of 188 air toxics and identified a group of 21 as mobile-source air toxics (MSATs), which are set forth in an EPA final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources*, published in February 2007 as 40 CFR Parts 59, 80, 85, and 86. MSATs are compounds emitted from highway vehicles and non-road equipment. Some MSAT compounds are present in fuel and are emitted when the fuel evaporates or passes through the engine unburned. Other MSATs are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal MSATs also result from engine wear, erosion of brake linings and tires, or impurities in oil or gasoline. Based on EPA's research, FHWA has identified a subset list of six "priority MSATs." These are described below:

- Benzene is characterized as a known human carcinogen.
- The potential carcinogenicity of Acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- Formaldehyde is a probable human carcinogen based on limited evidence in humans and sufficient evidence in animals.
- 1,3-butadiene is characterized as carcinogenic to humans by inhalation.
- Acetaldehyde is a probable human carcinogen based on an increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. DE, as it is reviewed in this document, is the combination of diesel particulate matter (DPM) and DE organic gases. DE also causes chronic respiratory effects. Prolonged exposure may impair pulmonary function and could produce symptoms such as coughing, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

3.8.1.2 National Ambient Air Quality Standards

NAAQS are set by the EPA and have been established as the official ambient air quality standards for Utah. These standards include both primary standards to protect public health and secondary standards to protect public welfare (e.g., protecting property and vegetation from the effects of air pollution). Table 3.8-1 lists the NAAQS. The primary and secondary standards set by the EPA are the same, with the exception of CO, for which no secondary standard has been identified.

Table 3.8-1: National Ambient Air Quality Standards

Pollutant	National (EPA) Standard[a]	
	Primary	Secondary
Lead (Pb)		
Quarterly Average	1.5 µg/m^3	1.5 µg/m^3
Particulate Matter (PM_{10})		
Annual arithmetic mean	50 µg/m^3	50 µg/m^3
24-hour average	150 µg/m^3	150 µg/m^3
Particulate Matter ($PM_{2.5}$)		
Annual arithmetic mean	15 µg/m^3	15 µg/m^3
24-hour average	35 µg/m^3	35 µg/m^3

Table 3.8-1: National Ambient Air Quality Standards - continued

Pollutant	National (EPA) Standard[a]	
	Primary	Secondary
Carbon Monoxide (CO)		
8-hour average	9 ppm	No standard
1-hour average	35 ppm	No standard
Ozone (O_3)		
8-hour average	0.075 ppm	0.075 ppm
Nitrogen Dioxide (NO_2)		
Annual average	0.05 ppm	0.05 ppm

Notes: Annual standards are never to be exceeded. Short-term standards are not to be exceeded more than one calendar day per year, with the following exceptions. Compliance with the 8-hour ozone standard is based on the 3-year average of the 4th-highest daily maximum concentration measured at any monitor. Compliance with the 24-hour $PM_{2.5}$ standard is based on the 3-year average of the 98th-percentile average of population-based monitoring locations.

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

[a] Primary standards are set to protect public health. Secondary standards are based on other factors (e.g., protecting crops and materials, avoiding nuisance conditions).

3.8.1.3 Air Quality Attainment Status

The CAA requires that all areas with violations of the NAAQS be designated nonattainment areas (i.e., out of compliance with established air quality standards). In nonattainment areas, a state implementation plan (SIP) must be developed by the state air agency and approved by the EPA that identifies control strategies and emission budgets for bringing the region back into compliance with the NAAQS for the respective pollutant. Maintenance areas are areas that have been in violation of the NAAQS and were originally designated as nonattainment areas, but are now meeting the NAAQS. For an area to be redesignated as maintenance, the state agency is required to prepare a maintenance plan to demonstrate that the NAAQS have been met and that regional emissions will be controlled sufficiently to ensure that violations of the NAAQS will not reoccur.

Table 3.8-2 lists the current attainment area status for each county and major municipality within the study area.

Table 3.8-2: Attainment Area Status for Project Area

Areas	Status	Pollutants
Provo City Limits	Maintenance area	CO within Provo city limits.
Utah County	Moderate nonattainment area (entire county)	Particulate matter (PM_{10})
Salt Lake City Metropolitan Area	Maintenance area	CO within the city limits of Salt Lake City.
Salt Lake County	Moderate nonattainment area (entire county)	Particulate matter (PM_{10})

Sources: Utah Department of Environmental Quality, Division of Air Quality 2004b; U.S. Environmental Protection Agency 2004.

As described later in this section, on December 18, 2007 UDAQ submitted its recommendation that the majority of Salt Lake County and the majority of Utah County should be re-designated as distinct $PM_{2.5}$ areas. Furthermore, as also described later in Section 3.8.2.2, it is likely the Wasatch Front counties will eventually be re-designated as ozone nonattainment areas as a result of EPA's recent revision of the 8-hour NAAQS for ozone. However, those re-designations will not affect Transportation Conformity determinations and National Environmental Policy Act (NEPA) environmental documents for several years. Therefore, for this EIS the study area was assumed to be a current attainment area for both $PM_{2.5}$ and ozone.

Particulate Matter Less Than 2.5 Microns in Diameter ($PM_{2.5}$)

On December 18, 2006, EPA revised the 24-hour $PM_{2.5}$ standard from 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$. An area will meet the revised 24-hour standard if the 98th percentile of 24-hour $PM_{2.5}$ concentrations in a year (averaged over 3 years) is less than or equal to the 35 $\mu g/m^3$ standard. By December 2007, the State of Utah will make recommendations for areas to be designated attainment (meeting the standard) and nonattainment (exceeding the standard). EPA intends to make official attainment and nonattainment designations by December 2008, and those designations would become effective in April 2009.

It is anticipated that portions of Salt Lake and Utah counties will be designated as non-attainment areas under the revised $PM_{2.5}$ standard (Utah Division of Air Quality 2006b). If these areas are designated as non-attainment areas for $PM_{2.5}$, WFRC and MAG will need to demonstrate that projects such as the I-15 project meet the $PM_{2.5}$ project-level conformity requirements one year after the effective date of non-attainment designations, which will be April of 2010 (i.e., they are included in a conforming long-range transportation plan and transportation improvement program, and they have met the hot spot requirements).

Under the transportation conformity rule, $PM_{2.5}$ hot spot analyses are required for "projects of air quality concern". A new highway project could be considered a "project of air quality concern" if it is expected to carry traffic volumes of 125,000 vehicles per day, with 8% or more truck traffic (that is, 10,000 trucks per day). Traffic volumes south of US-6 (Spanish Fork Exit 258) are projected to be 110,500 vehicles per day or less while volumes from US-6 to the north will exceed 125,000 vehicles per day.

A project-level conformity determination is required for the first federal approval action after the 1-year grace period for new non-attainment areas expires, which is expected to be in April 2011 for $PM_{2.5}$ (project-level conformity requirements already apply in the I-15 project area for CO and PM_{10}, and the Record of Decision for the I-15 project will include a project-level conformity determination for these two pollutants). Since additional federal approvals for this project are expected after April 2011, conformity will eventually apply to this project (assuming that the area is designated non-attainment for $PM_{2.5}$), and the U.S. Department of Transportation will comply with whatever $PM_{2.5}$ conformity requirements apply at that time.

Even though transportation conformity does not currently apply for $PM_{2.5}$, and the U.S. Department of Transportation will not be making a conformity determination for $PM_{2.5}$ as part of this EIS, the following discussion generally follows the approach described in the March 29, 2006 EPA and FHWA guidance, *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in $PM_{2.5}$ and PM_{10} Non-attainment and Maintenance Areas*. At this point, FHWA has not released guidance on how to address the revised $PM_{2.5}$ standard in NEPA documents.

At the national level, the EPA has established several control programs that will reduce emissions from most major sources of $PM_{2.5}$ and its precursors. The EPA's Tier 2 light-duty vehicle regulations, 2007 heavy-duty vehicle standards, and control of the sulfur content of fuels are expected to reduce motor vehicle emission rates between 2005 and the expected opening year of the project. The EPA's May 2004 non-road engine regulations (http://www.epa.gov/nonroad-diesel/2004fr/420f04032.pdf) will take effect starting in 2008 and will reduce PM and NOx emissions from these vehicles by 90% by 2030. In March 2007, the EPA proposed new regulations to reduce locomotive emissions of PM by 90% and NOx by 80% (http://www.epa.gov/otaq/locomotv.htm). Regional programs to reduce visible air pollution coordinated by an interstate planning group known as the Western Regional Air Partnership will also have beneficial impacts on ambient $PM_{2.5}$ concentrations.

Regional PM_{10} modeling for conformity by WFRC and MAG shows similar trends for mobile source emissions. Tables C-12a and C-12b of WFRC's conformity documentation dated May 31, 2007 show declines in vehicle emission rates that largely mirror the national trends; when growth in regional vehicle miles traveled (VMT) is taken into account, NOx emissions will decline throughout the planning period, while PM_{10} emissions will increase slightly between 2015 and 2030 (although levels remain well below the applicable emission budgets set to prevent violations of the PM_{10} air quality standards) (http://wfrc.org/cms/publications/Adopted_2007-2030_RTP/Appendix%20C%20-%20Air%20Quality%20Conformity.pdf). MAG's conformity documentation dated April 2007 shows similar trends in emission rates and total PM_{10} and NOx emissions (http://www.mountainland.org/Transportation_Plans/2007_Regional_Transportation_Plan/Document/Conformity%20Determination.pdf).

8-Hour Ozone

The Wasatch Front region has been in attainment with ozone standards since EPA revoked the 1-hour standard in 2005 (the region had always complied with the 8-hour ozone standard). On March 12, 2008, EPA revised the 8-hour ozone standard downward. Measure 8-hour ozone concentrations in many Wasatch Front counties exceed the new NAAQS standard, so it is likely portions of the Wasatch Front counties will eventually be re-designated as ozone nonattainment areas. EPA and UDAQ are expected to complete the following administrative process to re-designate the region to nonattainment (Bob Clark personal communication):

- March 2009. UDAQ submits its recommendation to EPA to re-designate the Wasatch Front counties.
- March 2010. EPA finalizes the re-designation
- 2011. WFRC and MAG develop their triennial emission inventories, and specify motor vehicle emission budgets for ozone precursors.
- 2012. Federally-funded highway projects in the Wasatch Front counties must satisfy Transportation Conformity for ozone.
- 2013. UDAQ submits the revised State Implementation Plan to EPA.

The NEPA process for the I-15 project will be completed before 2012, which is the starting date after which projects must satisfy Transportation Conformity for ozone. Therefore, the Transportation Conformity analysis completed for this EIS was done assuming the region is an attainment area for ozone.

3.8.1.4 Transportation Conformity Regulations

The Transportation Equity Act (TEA-21) and the CAA Amendments require that all regionally significant highway and transit projects in air quality nonattainment and maintenance areas come from a conforming transportation plan and transportation improvement program. A conforming plan is one that has been analyzed regionally for emissions of controlled air pollutants and meets the requirements of 40 CFR Part 93. Transportation plans, programs and projects are said to conform if they would not result in any of the following:

- new violations of the NAAQS;
- increases in the frequency or severity of existing violations of the NAAQS; and
- delays in attainment of the NAAQS.

For any given proposed highway project, these requirements are generally demonstrated by a two-step process, which must be described in the NEPA environmental document for the proposed project. A regional (mesoscale) air quality assessment is conducted to demonstrate two requirements:

- The combined traffic-related emissions from within the entire nonattainment area (including emissions from the proposed project) are included in each MPO's conformity regional emissions analysis.
- The combined emissions from within the nonattainment area are less than the allowable emission budgets set by the SIP, or if there is no SIP, comply with the interim emissions tests prescribed by the federal conformity regulations.

In addition, a project-level (microscale) air quality assessment (also called a *project-level hot spot analysis*) is conducted to evaluate short-term CO and PM concentrations adjacent to the I-15 corridor.

3.8.1.5 Federal Mobile-Source Emission Rules

In addition to the criteria pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries). MSATs are a subset of the 188 air toxics defined by the CAA. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted into the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or impurities in oil or gasoline.

EPA is the lead federal agency for administering the CAA and has specific responsibilities for determining the health effects of MSATs. On March 29, 2001, EPA issued the Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229). In its rule, EPA examined the impacts of existing and newly promulgated mobile-source control programs, including its reformulated gasoline program, its national low-emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur-control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur-control requirements. Between 2000 and 2020, FHWA projects that, even with a 64% increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67% to 76% and reduce on-highway diesel particulate emissions by 90%.

In February 2007, EPA issued a final rule to reduce hazardous air pollutants from mobile sources. The final standards will lower emissions of benzene and other air toxics in three ways: 1) by lowering the benzene content in gasoline, 2) by reducing exhaust emissions from passenger vehicles operated at cold temperatures (under 75°F), and 3) by reducing emissions that evaporate from, and permeate through, portable fuel containers. Under this rule, EPA expects that new fuel benzene and hydrocarbon standards for vehicles and gas cans will reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. As a result, new passenger vehicles will emit 45% less benzene, gas cans will emit 78% less benzene, and gasoline will have 38% less benzene overall.

3.8.1.6 State Regulations

UDAQ is responsible for the permitting of air pollutant sources and enforcement of emissions standards to satisfy NAAQS requirements. UDAQ is also responsible for coordinating with the EPA to specify nonattainment areas and preparing the SIP and maintenance plans. As part of those plans, UDAQ is responsible for developing emission budgets for future years to ensure future compliance with the NAAQS.

3.8.1.7 Local Air Quality Jurisdictions

The MPOs are responsible for periodically conducting transportation conformity analyses to demonstrate that the combined regional transportation projects conform to the emission tests specified by the conformity rule. For the proposed project, the two MPOs—MAG for Utah County and WFRC for Salt Lake County—conduct the regional conformity analyses, and FHWA issues the conformity determination as part of the NEPA documentation. Both the regional (mesoscale) evaluation completed by the MPOs and the project-level (microscale) evaluations completed for the NEPA document for individual projects are used to help determine whether the proposed project would meet the conformity requirements of the Clean Air Act.

3.8.2 Affected Environment

This section describes the existing conditions for climate within the study area, current air quality regulatory setting, and existing concentrations of key air pollutants at representative monitoring stations operated by the UDAQ, along the I-15 corridor. Information related to existing conditions for air quality and climate was obtained from the following sources:

- Climatological data for the study area were obtained from the website for the Western Regional Climate Center (WRCC) (2004).
- Data for historical air quality monitoring were obtained from the website for UDAQ (2004a).
- Information for air quality nonattainment area status was obtained from the website for UDAQ (2004b).

3.8.2.1 Climate

The study area is located within the Wasatch Front region of Utah. The northern part of the study area includes portions of the metropolitan area of South Salt Lake County, which is bordered on the east by the Wasatch Range. The I-15 corridor crosses the Utah County/Salt Lake County line at the Traverse Mountains, then drops in elevation to the Salt Lake City metropolitan area. Climate in the area is influenced by the altitude of the study area, the Wasatch Range, and Great Salt Lake. Annual average climatological data are listed in Table 3.8-3 for representative monitoring stations.

Table 3.8-3: Climatological Data for Project Area

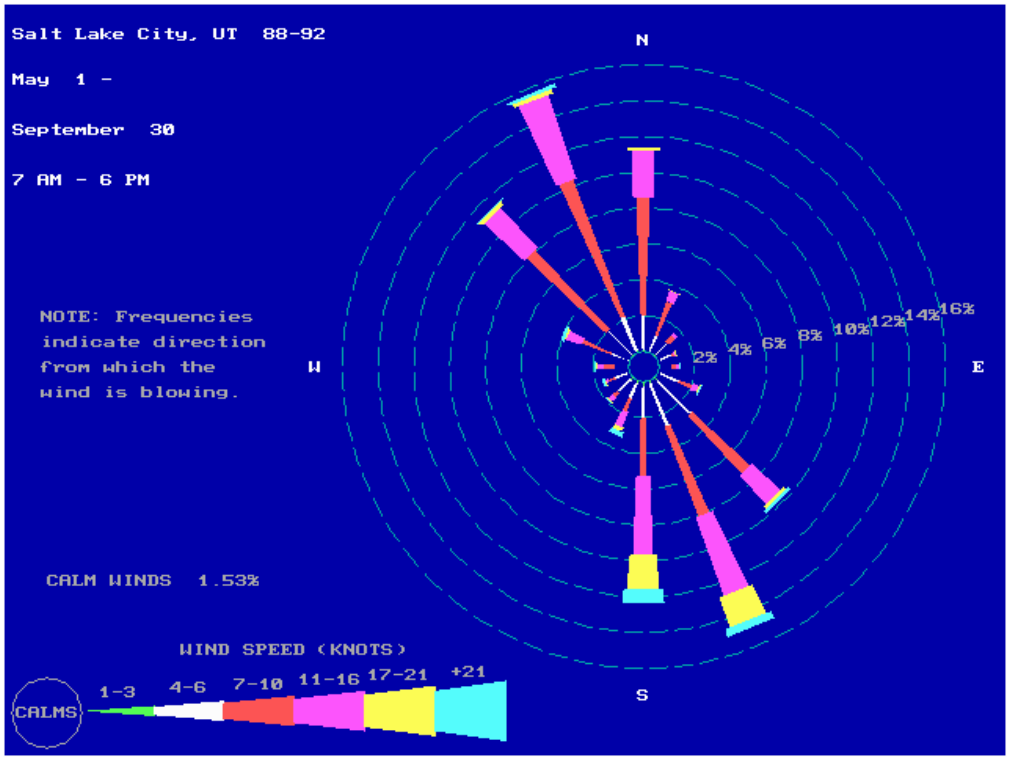
Station	Average Daily Maximum Summer Temperature	Average Daily Minimum Winter Temperature	Annual Average Precipitation
Provo, UT	92ºF—August	21ºF—January	21.1 inches
Cottonwood (Holladay, UT)	90ºF—August	22ºF—January	23.9 inches

Source: Western Regional Climate Center 2004

Temperature inversions occur frequently in the Wasatch Front region, particularly between November and February, although inversions occur during summer as well. Temperature inversions occur an average of 115 days per year at Salt Lake City (Utah Department of Environmental Quality, Division of Air Quality, 1997). Inversions are responsible for air stagnation problems that often occur during the cold winter months. Under typical atmospheric conditions, warm air near the ground surface rises and is replaced by cooler air, thus allowing air circulation that disperses ground-level air pollutants. However, under temperature inversion conditions, stable high-pressure weather systems trap cold air near the surface. Very little circulation occurs, so pollutant concentrations build up near the ground surface. In the Salt Lake City area, the stagnant air layers caused by temperature inversions are generally confined to the valley floors.

Figure 3.8-1 shows the wind rose for Salt Lake City (EPA 2008). The wind rose shows the annual frequency by which the wind blows from the listed direction, and the average wind speeds for wind blowing from that direction. Prevailing winds at Salt Lake City are from the north-northwest or the south-southeast, which matches the generally north-south orientation of the I-15 alignment within the study area.

Figure 3.8-1: Wind Rose for Salt Lake City



3.8.2.2 Historical and Existing Ambient Air Pollutant Concentrations

UDAQ operates ambient air quality monitoring stations throughout the region to monitor air pollutant concentrations; comparisons are then made to the allowable NAAQS, described below. For this assessment, recent historical monitoring data were evaluated for key air pollutants (CO, 0_3, PM_{10}, and $PM_{2.5}$) at representative monitoring locations within the study area.

- North Provo (1355 North 200 West, Provo City, Utah). This station monitors CO, O_3, PM_{10}, and $PM_{2.5}$.
- Orem (1580 South State Street, Orem, Utah). This station monitors CO.
- Lindon (50 North Main Street, Lindon, Utah). This station monitors PM_{10} and $PM_{2.5}$.
- Herriman (5600 West 12950 South, Herriman, Utah). This station monitors O_3.
- Cottonwood (5715 South 1400 East, Holladay, Utah). This station monitors CO, O_3, PM_{10}, and $PM_{2.5}$.
- Magna (2935 South 8660 West, Magna). This station monitors PM_{10}.
- Hawthorne (1675 South 600 East, Salt Lake City). This station monitors CO, PM_{10}, and $PM_{2.5}$.

Air pollutant concentrations in the study area have generally decreased since the early 1990s, and exceedances of the NAAQS are now rare despite steady increases in regional population and motor vehicle travel (Utah Division of Air Quality 2007). A portion of this improvement has resulted from the shutdown of some major industrial plants in the area (e.g., shutdown of the Geneva Steel Plant). However, most of the improvement has resulted from reductions in emissions from operating industrial facilities due to ongoing UDAQ regulations, as well as steady reduction of on-road vehicle exhaust emissions due to the EPA's ongoing motor vehicle emission programs. Historical increases in the amount of regional VMT have been more than offset by the historical improvement in emissions from each individual vehicle.

Measured CO concentrations for the period 2000–2003 are listed in Table 3.8-4. There were no violations of the NAAQS during that period at any of the local monitoring stations. Measured O_3 concentrations for the period 2000–2003 are listed in Table 3.8-5. During that period, there was one exceedance of the NAAQS, at the Cottonwood station. That single exceedance does not constitute a violation of the NAAQS, because the standard is based on the 3-year average of the 4th-highest daily concentration in any given year at any given location.

Historical ozone concentrations are listed in Table 3.8-5. There were no historical exceedances based on the 8-hour NAAQS in place before March 2008, but the most recent ozone concentrations exceed the new 8-hour NAAQS enacted in March 2008. It is likely the Wasatch Front counties will re-designated as ozone no attainment areas starting in 2010, and starting in 2012 federally-funded highway projects will be required to conduct Transportation Conformity assessments for ozone.

Measured PM_{10} concentrations at monitoring stations along the I-15 corridor for the period 2001–2005 are listed in Table 3.8-6. There were two exceedances of the NAAQS during that period at the Lindon station. Those exceedances do not constitute a violation of the NAAQS, because the standard is based on the 2nd-highest daily occurrence in any one year at any given location.

Measured $PM_{2.5}$ concentrations for the period 2001–2005 at the monitoring stations within the I-15 corridor are listed in Table 3.8-7. There were multiple exceedances of the new $PM_{2.5}$ NAAQS at each of the monitoring stations along the I-15 corridor. Violations of the NAAQS are based on the 3-year average of the 98th-percentile concentrations. The measured concentrations constitute a violation of the NAAQS. As a result, on December 18, 2007 UDAQ submitted their formal recommendation to the EPA. They recommended the majority of Salt Lake County and the majority of Utah County be re-designated as two distinct $PM_{2.5}$ nonattainment areas. The re-designations will take effect in April 2009. Starting in April 2010 conformity analyses for transportation projects must begin to account for the upcoming $PM_{2.5}$ nonattainment areas.

Table 3.8-4: Carbon Monoxide Air Quality Monitoring Data

Station	Year	Highest 8-Hour Value (ppm)	Number of Days of Exceedances above NAAQS
North Provo	2003	3.0	0
	2002	4	0
	2001	4	0
	2000	4	0
Orem	2003	2.8	0
	2002	5	0
	2001	4	0
	2000	4	0
Cottonwood	2003	3.2	0
	2002	4	0
	2001	4	0
	2000	4	0

Note: 8-hour NAAQS = 9 ppm - Source: Utah Department of Environmental Quality, Division of Air Quality, 2004a.

Table 3.8-5: Ozone Air Quality Monitoring Data

Station	Year	Highest 8-Hour Value (ppm)	Number of Days of Exceedances above NAAQS Prior to March 2008 Revision
North Provo	2003	0.081	0
	2002	0.082	0
	2001	0.076	0
	2000	0.099	0
Herriman	2003	0.079	0
	2002	0.083	0
	2001	0.082	0
	2000	0.116	0
Cottonwood	2003	0.083	0
	2002	0.086	1
	2001	0.083	0
	2000	0.111	0

Note: Previous 8-hour NAAQS = 0.08 ppm, revised NAAQS = 0.075 ppm after March 2008. Compliance with the 8-hour ozone standard is based on the 3-year average of the 4th-highest daily maximum concentration measured at any monitor.

Source: Utah Department of Environmental Quality, Division of Air Quality, 2004a.

Table 3.8-6: PM_{10} Air Quality Monitoring Data

Station	Parameter	2001	2002	2003	2004	2005
Salt Lake County						
Cottonwood (5715 South 1400 East, Holladay)	Annual average (µg/m^3)[a] Peak 24-hour value (µg/m^3)[b] Days above standard	32 104 0	32 119 0	28 92 0	32 145 0	27 114 0
Hawthorne (1675 South 600 East, Salt Lake City)	Annual average (µg/m^3) Peak 24-hour value (µg/m^3) Days above standard	30 105 0	29 130 0	26 360 2	29 129 0	24 139 0
Magna (2935 South 8560 West, Magna)	Annual average (µg/m^3) Peak 24-hour value (µg/m^3) Days above standard	25 201 2	25 87 0	26 421 1	24 88 0	22 177 1

Table 3.8-6: PM_{10} Air Quality Monitoring Data - Continued

Station	Parameter	2001	2002	2003	2004	2005
North Salt Lake (1795 North 1000 West, Salt Lake City)	Annual average (µg/m^3) Peak 24-hour value (µg/m^3) Days above standard	44 153 0	41 121 0	40 358 3	42 189 1	37 153 0
Utah County						
Lindon (50 N. Main Street, Lindon)	Annual average (µg/m^3) Peak 24-hour value (µg/m^3) Days above standard	34 111 0	32 288 1	25 150 0	29 159 1	25 86 0
North Provo (1355 North 200 West, Provo)	Annual average (µg/m^3) Peak 24-hour value (µg/m^3) Days above standard	29 95 0	29 82 0	23 76 0	25 100 0	21 68 0

[a] Annual PM_{10} standard = 50 µg/m^3 (annual standard revoked by EPA on December 18, 2006)

[b] 24-hour PM_{10} standard = 150 µg/m^3 (standard allows for three exceedances over a 3-year period)

Source: U.S. Environmental Protection Agency 2007a

Table 3.8-7: $PM_{2.5}$ Air Quality Monitoring Data

Station	Parameter	2001	2002	2003	2004	2005
Salt Lake County						
Cottonwood (5715 South 1400 East, Holladay)	Annual average (ppm)[a] Peak 24-hour value (ppm)[b] (98th percentile)	13.2 77 (68)	14.1 84 (65)	10.5 57 (32)	14.3 69 (66)	11.1 63 (42)
Herriman (5600 West 12950 South, Herriman)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	13.3 69 (69)	8.3 60 (38)	7.0 28 (25)	10.9 62 (48)	7.8 40 (27)
Hawthorne (1675 South 600 East, Salt Lake City)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	12.4 81 (66)	12.7 90 (56)	9.6 60 (34)	14.2 94 (64)	11.0 61 (43)
North Salt Lake (1795 North 1000 West, Salt Lake City)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	14.1 67 (58)	15.5 92 (56)	12.3 55 (46)	17.8 86 (57)	14.1 63 (44)
West Valley City (3275 West 3100 South, West Valley City)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	12.9 67 (60)	13.4 86 (58)	11.1 55 (45)	13.9 74 (61)	12.0 63 (40)

Table 3.8-7: $PM_{2.5}$ Air Quality Monitoring Data - Continued

Station	Parameter	2001	2002	2003	2004	2005
Utah County						
Highland (10865 North 6000 West, Provo)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	10.2 73 (54)	9.1 47 (30)	7.1 36 (23)	10.7 75 (50)	8.1 43 (34)
Lindon (30 N. Main Street, Lindon)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	11.6 78 (61)	10.9 66 (43)	8.6 61 (29)	12.8 82 (64)	10.0 60 (37)
North Provo (1355 North 200 West, Provo)	Annual average (ppm) Peak 24-hour value (ppm) (98th percentile)	11.8 83 (49)	11.6 58 (40)	9.2 42 (28)	11.1 67 (54)	9.8 46 (36)

Notes: From 2001 to 2004, the 24-hour $PM_{2.5}$ standard was 65 µg/m^3. This was revised to 35 µg/m^3 in 2005. Nearly all Wasatch Front monitoring sites in Salt Lake and Utah counties show a violation of the revised 24-hour $PM_{2.5}$ standard.

[a] Annual $PM_{2.5}$ standard = 15 µg/m^3

[b] 24-hour $PM_{2.5}$ standard = 35 µg/m^3 (violations determined from 98th-percentile concentrations)

Source: U.S. Environmental Protection Agency 2007a

As noted above, the relative contribution of regional and localized sources to total ambient PM2.5 concentrations in the Wasatch Front is currently unclear. Although I-15 traffic volumes increased by more than 28% between 2000 and 2005, the annual-average PM_{10} and $PM_{2.5}$ concentrations steadily decreased during that same period (Table 3.8-6 and Table 3.8-7). This suggests that localized emissions from vehicle traffic may be only one of many contributors to overall PM_{10} and $PM_{2.5}$ concentrations.

3.8.2.3 Sensitive Receptor Locations

The I-15 corridor passes through a variety of land uses including urbanized areas and rural areas. In some cases, sensitive receptors are near the I-15 alignment. Section 3.2, Social, Demographics, and Community Cohesion, describes demographics near the alignment. Table 3.2-2, Schools and Libraries, lists the locations where school children are likely to be present.

3.8.3 Analysis Methodology for Air Quality Impact Assessment

The methodologies and results for the air quality analyses are summarized below.

3.8.3.1 Methodology for Transportation Conformity Analysis

Both regional and project-level air quality evaluations were used to verify the proposed I-15 project would conform to the approved SIP, as described below.

Regional Transportation Conformity Evaluation

The FHWA publication Transportation Conformity Reference Guide (2001) and the UDOT Environmental Process Manual of Instruction (2005) identify the requirements for evaluating potential air quality impacts associated with transportation projects and provide guidance on completing regional and project-level air quality evaluations. Regional evaluations are conducted by the local MPOs in accordance with transportation conformity requirements. The MPO responsible for completing the regional evaluation in Salt Lake County is WFRC, while MAG is the MPO

responsible for assessments in Utah County. The most recent mesoscale evaluation for Salt Lake County is the Conformity Analysis for the WFRC 2030 Regional Transportation Plan (Wasatch Front Regional Council 2007). Similarly, MAG described its most recent regional air quality analysis in its document titled Draft Conformity Determination Report, Mountainland MPO, 2030 Regional Transportation Plan (2007).

Project-Level Carbon Monoxide Hot Spot Analysis

Project-level evaluations are related to localized air quality impacts, primarily at the roadway or intersection level. The CAL3QHC Line Source Dispersion Model (Version 2.0), which is the air quality dispersion model recommended by the EPA and UDOT for roadway projects, was used to complete the project-level CO hot spot analysis. This model was used to calculate peak 1-hour CO concentrations near selected interchanges and adjacent to the freeway mainline. The CO hot spot analysis was conducted as follows according to the UDOT Environmental Process Manual of Instruction and with consultation from UDOT air quality managers[1]:

Peak-hour traffic volume and level of service forecasts for 93 project-influenced intersections were evaluated. Based on those comparisons, the following two heavily traveled and congested intersections associated with the project were selected for CO hot spot analysis:

- the intersection of Eastbay Boulevard with University Avenue in Provo, which is the most heavily congested and most heavily traveled signalized intersection associated with the project within the Provo/Orem CO maintenance area; and
- the signalized intersection and interchange at I-15 and 800 North in Orem, which is outside any CO maintenance areas but represents the most heavily traveled and most heavily congested intersection/interchange associated with the project.

The CAL3QHC dispersion model was used to estimate maximum 1-hour CO concentrations adjacent to each intersection and freeway mainline segment, using the CO emission factors specified by the UDOT Environmental Process Manual of Instruction. Maximum 8-hour impacts were estimated by multiplying the modeled 1-hour impacts by a 0.7 scale factor. Background concentrations of 6 ppm (1-hour) and 4 ppm (8-hour) were then added to the CAL3QHC values. These background values were selected because they were the highest measured CO concentrations in Salt Lake County and Utah County in 2004–2005.

Consultation for Qualitative Project-Level PM10 Evaluation

The I-15 corridor is within PM_{10} nonattainment areas in Salt Lake County and Utah County. A qualitative PM_{10} evaluation was conducted according to the UDOT Environmental Process Manual of Instruction. Information on UDAQ's PM_{10} modeling for the SIP was obtained through consultation with UDAQ; information on UDOT's road sanding and sweeping protocols was obtained through consultation with UDOT personnel[2]. Information on emission budgets for primary fugitive dust and secondary PM_{10} was obtained by consultation with MAG[3]. An updated qualitative PM_{10} evaluation and project-level conformity determination for the preferred alternative will be prepared for the FEIS.

[1] Chaney, Jerry. Staff member, Utah Department of Transportation. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

[2] Barickman, Patrick. Staff member, Utah Department of Air Quality. April 26, 2007—Telephone conversation with James Wilder, Jones & Stokes.

[3] Hardy, Susan. Staff member, Mountainland Association of Governments. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

3.8.3.2 Methodology for Regional Criteria Pollutant and Mobile Source Air Toxics Emission Evaluation

Regional emissions of MSATs were evaluated according to FHWA's methodology specified in its Interim Guidance on Air Toxic Analysis in NEPA Documents (2006). FHWA's Easy Mobile Inventory Tool (EMIT) model was used to estimate regional MSAT emissions from project-influenced roadways for 2001 baseline conditions and the 2030 design year for Alternative 4 (I-15 Widening and Reconstruction) and Alternative 1 (No Build). For this EIS analysis, FHWA specified that "project-influenced roadways" include all roadway segments in the region for which 2030 annual average daily traffic (AADT) volumes differ by more than 5% between Alternative 4 and Alternative 1. Forecast AADT traffic volumes for each project-influenced roadway segment were modeled as described in Chapter 2, Alternatives Considered. Roadways considered for the analysis include regional freeway segments, on-ramps and off-ramps, major and minor arterials, and urban connectors. The EMIT model uses the EPA's MOBILE6.2 model to develop factors for tailpipe emissions along each roadway segment. MOBILE6.2 input parameters were obtained from WFRC and MAG.

3.8.4 Alternative 1- No Build

3.8.4.1 Nationwide MSAT Emission Reduction Trends

As described previously, for its MSAT rules, the EPA examined the benefits of existing and newly promulgated mobile source control programs, including its RFG program, NLEV standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Figure 3.8-2 shows FHWA's forecasted trends in nationwide tailpipe emissions (FHWA 2006). Between 2000 and 2020, even with a 64% increase in nationwide VMT, FHWA projects that these programs will reduce nationwide on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67% to 76%. In addition, it will reduce nationwide highway DPM emissions by 90%.

As described in the following section, the nationwide trend of improvement in MSAT emissions is also expected to apply within the I-15 regional study area. Compared to 2001 baseline conditions, regional vehicle travel is forecasted to increase, but regional MSAT emissions are forecasted to decrease.

Unavailable Information for Project-Specific MSAT Impact Analysis

This section includes a basic analysis of the likely MSAT emission impacts associated with the proposed project. The available technical tools do not allow FHWA and UDOT to predict the project-specific health impacts of the MSAT emissions associated with the project. Because of these limitations, the following discussion is included in accordance with the regulations of the Council on Environmental Quality (40 CFR 1502.22[b]) regarding incomplete or unavailable information.

Information That Is Unavailable or Incomplete

Evaluating the environmental and health impacts of MSATs from a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling to estimate ambient concentrations resulting from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and a final determination of health impacts based on the estimated exposure. Each of these steps is limited by technical shortcomings or scientific uncertainty that prevents a more complete determination of the health impacts of MSATs from the project.

Emissions. The EPA tools for estimating MSAT emissions from motor vehicles are not sensitive to key variables needed to determine the emissions from highway projects. Although the MOBILE6.2 model is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 emission factors are based on a typical trip length of about 7.5 miles, with average speeds for such typical trips. As a result, MOBILE6.2 does not have the ability to predict emission rates for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE6.2 can only approximate the operating speeds and levels of congestion likely to contribute to emissions on a regional scale, and cannot adequately capture the emissions effects

of specific projects. In its discussions of particulate matter under the conformity rule, EPA has identified problems with MOBILE6.2 as a general impediment to quantitative analysis.

These deficiencies compromise the ability of MOBILE6.2 to accurately estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emission trends and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

Dispersion. The tools to predict how MSATs disperse in the environment are also limited. Current regulatory models (e.g., CAL3QHC) were developed and validated more than 10 years ago for predicting episodic concentrations of CO to determine compliance with the NAAQS.

The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at a specific time and location in a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess the potential health risk. The National Cooperative Highway Research Program is conducting research on best practices in applying models and other technical methods to assist in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, there is also a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be predicted accurately, limitations in current techniques for exposure assessment and risk analysis prevent FHWA from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roads and then determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are compounded for determining 70-year cancer assessments, especially because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emissions, there are a variety of studies indicating that some emissions are either statistically associated with adverse health outcomes (frequently based on emission levels found in occupational settings) or indicating that laboratory animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to air toxics has been the focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable at the county level. While they were not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a state or national level.

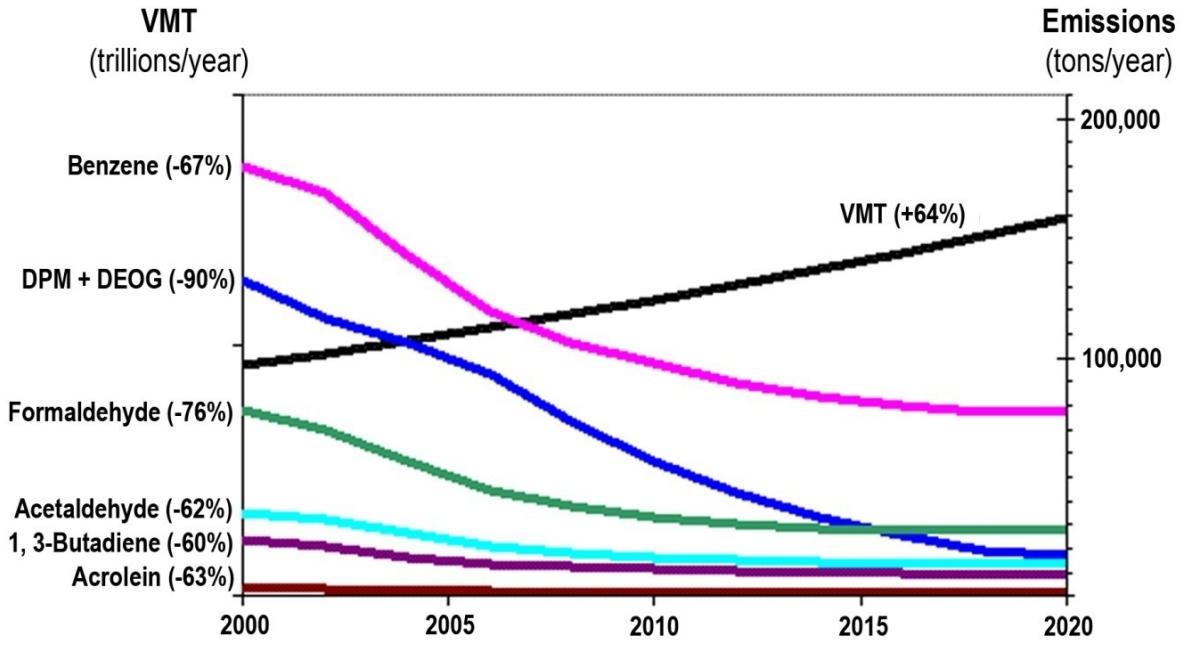
EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that could result from exposure to various substances found in the environment. Other studies address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile-source pollutants, and other topics. The final summary of the series is not expected for several years. A workshop

sponsored by the Johns Hopkins School of Public Health (2004) concluded that residences close to roadways with high traffic density are associated with an increased risk of a broad spectrum of health outcomes in adults and children, including mortality, lung function, and lung cancer in adults, as well as respiratory symptoms including asthma/wheezing and lung function in children. Recent studies also support a finding of increased risk from exposure in proximity to transportation facilities. Two recent studies (McConnell et al. 2006; Gauderman et al. 2007) observed a statistically significant association of increasing childhood asthma rates with decreasing distance to freeways in several California towns. A recent study (ICF International 2007) summarizes information and guidelines on available analytical models and techniques to assess MSAT impacts and how such information can be communicated in the environmental process.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based on Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community

Because of the uncertainties discussed above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. Although available tools do allow FHWA to reasonably predict relative emission changes between alternatives for large projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for specific projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to determine whether the I-15 project would have "significant adverse impacts on the human environment."

Figure 3.8-2: Benefits of the EPA's Nationwide MSAT Regulations



Source: FHWA 2006.

3.8.4.2 Regional Tailpipe Emissions

The nationwide trend of steadily improving tailpipe emissions is forecasted to occur within the I-15 regional air quality study area for all project alternatives. The regional air quality study area was defined for this EIS to include all project-influenced roadways (defined as roadway segments in Salt Lake County and Utah County that will experience a 5% deviation in 2030 AADT between Alternative 1 (No-Build) and Alternative 4 (Preferred Alternative). Traffic volumes along I-15 and other regional roadways would increase by the 2030 design year as a result of regional population growth, as described in Chapter 1, Purpose and Need. However, those traffic volume increases will be more than offset by reductions in tailpipe emissions from individual cars as a result of EPA rules. FHWA's EMIT model and the EPA's MOBILE6.2 model were used to estimate regional tailpipe emissions along project-influenced regional roadways. Table 3.8-8 lists the estimated regional emissions for criteria air pollutants, carbon dioxide, and MSATs for the 2005 baseline year and the 2030 design year No Build and Preferred Alternative. The year 2005 was used as the baseline year for this analysis, because it is the most recent year for which the WFRC/MAG Regional Travel Demand Version 5 traffic model was calibrated against WFRC and MAG data.

As listed in the Net Change columns of Table 3.8-8, daily vehicle travel along the project-influenced roadways would increase under Alternative 1 between 2001 and 2030. Also, as listed in the Net Change columns, regional traffic volumes are expected to increase by 130% compared to the 2001 baseline conditions. Regardless, the regional emissions of criteria pollutants are forecasted to decrease during that period. Further, as listed in the Net Change columns, the regional emissions of criteria pollutants for Alternative 1 conditions would decrease by 10% to 74% compared to 2005 baseline values. Similarly, regional emissions of MSATs are forecasted to decrease under Alternative 1, with 2030 regional emissions decreasing by 26% to 91% compared to their 2005 baseline values.

Table 3.8-8: Regional Emissions on Project-Influenced Roadways

Pollutant	Total Emissions (Tons per Year)			Net Change (2030 Design Year Compared to 2005 Baseline)		
	2005 Baseline	2030 Alt. 1 No-Build	2030 Alt. 4 Preferred Alternative*	2030 Preferred Alternative Minus 2005 Baseline	2030 No-Build Minus 2005 Baseline	2030 Preferred Alternative Minus 2030 No-Build
Vehicle Miles Traveled per Day	6,157,000	11,810,000	12,614,000	105%	92%	7%
Mobile Source Air Toxics						
Acetaldehyde	14.05	10.42	10.91	-22%	-26%	5%
Acrolein	1.87	1.31	1.37	-27%	-30%	5%
Benzene	75.09	51.84	54.63	-27%	-31%	5%
1,3-Butadiene	10.28	7.12	7.52	-27%	-31%	6%
Diesel Particulate Matter (DPM)	69.99	6.33	6.76	-90%	-91%	7%
Formaldehyde	45.67	31.07	32.56	-29%	-32%	5%
Criteria Air Pollutants and Greenhouse Gases						
CO	56,810	50,971	55,174	-3%	-10%	8%
Carbon Dioxide (CO_2)	1,014,783	1,384,784	1,493,318	47%	36%	8%
PM_{10} (tailpipes, brakes, tire wear)	2,731	1,747	1,821	-33%	-36%	4%
$PM_{2.5}$ (tailpipes, brakes, tire wear)	6,519	1,923	2,086	-68%	-70%	8%
VOC	146	131	140	-4%	-10%	7%
NOx	103	61	65	-37%	-41%	7%
SO_2	227	439	469	107%	93%	7%

*Values provided are for the Preferred Alternative. Other design configurations would produce only negligible changes as VMT vary slightly.
Note: Listed values apply only to project-influenced roadways
Source: Jones & Stokes 2008

3.8.4.3 Local Ambient Air Pollutant Concentrations for Alternative 1

Under Alternative 1, I-15 widening and reconstruction would not occur, but ongoing routine improvements, such as bridge and pavement projects will occur. Traffic volumes on I-15 would increase, but the future increase in traffic volume would likely be more than offset by reductions in tailpipe emissions from individual vehicles as a result of the EPA's ongoing mobile source emission regulations. Therefore, future ambient air pollutant concentrations near I-15 and its interchanges are anticipated to be similar to or less than current levels.

3.8.5 Alternative 4: I-15 Widening and Reconstruction

3.8.5.1 Regional Conformity with State Implementation Plan

This section provides a qualitative discussion of the pollutants of concern based primarily on the regional conformity analyses completed for the WFRC and MAG long-range transportation plans, including the proposed project. WFRC's and MAG's most recent conformity analyses were both completed in 2007

Carbon Monoxide

Most of Alternative 4 is located in an attainment area for CO. However, the southernmost portion of the project is within the Provo CO maintenance area, and the northern terminus is near (but not within) the Salt Lake City CO maintenance area. Although most regional CO emissions can be attributed to motor vehicles, CO emissions can also result from industrial and natural processes such as metals processing, wood stoves, and forest fires. Substantial changes in other emission sources combined with changes in travel patterns and transportation networks might affect CO emissions at a regional level, but the effects of any individual project are likely to be small (Utah Department of Transportation 2003c).

The only CO maintenance area in MAG's jurisdiction is the City of Provo. The MAG's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated CO emissions for the transportation network within the Provo CO maintenance area for the period 2014–2030, and demonstrated that CO emissions in the city would be much less than the allowable CO emission budgets specified by the SIP (Mountainland Association of Governments 2007). Specifically, Provo transportation CO emissions are forecasted to be 28.63 tons per day in 2030, compared to the allowable emission budget of 72.1 tons per day.

The only CO maintenance area in Salt Lake County is the Salt Lake City metropolitan area, which is beyond the I-15 widening project's northern terminus. WFRC's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated CO emissions for the entire transportation network within the Salt Lake City maintenance area, and demonstrated that CO emissions in the city would be much less than the allowable CO emission budgets specified by the SIP (Wasatch Front Regional Council 2007). Specifically, Salt Lake City transportation CO emissions are forecasted to be 100.06 tons per day in 2030, compared to the allowable emission budget of 279 tons per day.

Particulate Matter (PM_{10})

Salt Lake County and Utah County are nonattainment areas for PM_{10}, as previously discussed. However, measured PM_{10} concentrations in the two counties have decreased since 1993, and exceedances of the PM10 NAAQS have become rare since the early 1990s (Utah Department of Environmental Quality, Division of Air Quality, 2007). Based on the PM_{10} monitoring data, UDAQ has petitioned the EPA to redesignate the two counties to PM_{10} maintenance areas. Regional characteristics play an important role in PM_{10} levels in Utah. The state's climate and geography influence regional PM_{10} impacts when temperature inversions cause particles to become trapped in the valleys. Meteorological conditions combined with changes in regional land use and transportation patterns might affect PM_{10} at a regional level, but the effects of any individual project are likely to be small (Utah Department of Transportation 2003c).

WFRC's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated PM_{10} emissions for the entire transportation network within Salt Lake County, and demonstrated that PM_{10} emissions in the county would be less than the allowable transportation-related PM_{10} emission budgets specified by the SIP (Wasatch Front Regional Council 2007). Specifically, countywide transportation-related primary PM_{10} emissions are forecasted to be 35.18 tons per day in 2030, compared to the allowable emission budget of 40.4 tons per day. County-wide NOx precursor emissions (related to secondary PM_{10}) are forecast to be 11.43 tons per day in 2030, well below the allowable emission budget of 32.3 tons per day.

MAG's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated PM_{10} emissions for the entire transportation network within Utah County for the period 2010–2030, and demonstrated the countywide PM_{10} emissions would be less than the allowable emission budgets specified by the SIP (Mountainland Association of Governments 2007). Specifically, countywide transportation PM_{10} emissions are forecasted to be 15.04 tons per day in 2010, compared to the allowable emission budget of 20.5 tons per day. (Note: Most of the PM_{10} emissions in that planning year are forecasted to be gaseous PM_{10} precursors that react in the atmosphere to form PM_{10} several miles downwind of the sources, while only a fraction of the PM_{10} emissions are particulate matter emitted directly from sources as fugitive dust, brake wear, or tailpipe emissions.)

As noted above, the relative contribution of regional and localized sources to total ambient PM_{10} concentrations in the Wasatch Front is currently unclear. However, it is worth noting that although traffic volumes on I-15 increased by more than 28% between 2000 and 2005, the annual-average PM_{10} concentrations listed in Table 3.8-6 generally decreased during this period, This suggests that localized emissions from vehicle traffic may be only one of many contributors to overall PM_{10} concentrations.

Future Conformity Issues Related to $PM_{2.5}$

Although the contribution of localized sources of $PM_{2.5}$ may be minor, construction of Alternative 4 would likely result in some increase in localized $PM_{2.5}$ concentrations along the I-15 alignment compared to Alternative 1. Changes in travel speeds could also have an impact on $PM_{2.5}$ emissions. While the EPA's MOBILE6.2 model does not predict how particulate matter emission rates change with speed, it is reasonable to assume that to the extent congestion relief provided by the I-15 widening project would reduce stop-and-go traffic conditions and vehicle idling, it would also reduce $PM_{2.5}$ tailpipe emissions on the affected roadways. Also, in cases where I-15 improvements reduce traffic volumes on arterial roadways with signalized intersections, $PM_{2.5}$ tailpipe emissions from vehicle idling at those intersections would also be reduced. It is uncertain how reducing congestion (and thereby increasing vehicle speed) would affect fugitive dust emissions of $PM_{2.5}$.

Motor vehicle emission rates are expected to decline between 2005 and the expected opening year of the project, with an additional reduction between 2015 and 2030. The EPA's transportation conformity guidance places special emphasis on emissions from diesel vehicles, and the expected emission reductions from diesel vehicles are even greater. The EPA's MOBILE6.2 model predicts that relative to 2005, nationwide diesel particulate emissions rates will decline by 80% by 2015 and 95% by 2030; in other words, 100,000 nationwide vehicles in 2005 would have the same diesel particulate emissions as 500,000 nationwide vehicles in 2015 or 2,000,000 vehicles in 2030. Similarly, the regional emission analyses presented earlier in this section demonstrated regional emissions of NOx (the main precursor of secondary PM2.5) are forecast to steadily decline in the future. That decline in precursor emissions would likely result in corresponding declines in secondary PM2.5 ambient concentrations.

Future Conformity Issues Related to Ozone Precursors (NOx and VOCs)

The Wasatch Front region has been in attainment with ozone standards since EPA revoked the 1-hour standard in 2005 (the region has always complied with the 8-hour ozone standard). On March 12, 2008, EPA completed a rule making process that revised the 8-hour ozone standard downward. Recent measured ozone concentrations exceed the new 8-hour NAAQS in the Wasatch Front counties, so it is likely the urbanized portions of Salt Lake County and Utah County will be re-designated as ozone nonattainment areas by 2010 (Bob Clark personal communication). Transportation Conformity requirements for the new ozone nonattainment areas will take effect starting as early as 2012 The NEPA process for the I-15 project is expected to be completed before that date, so for this EIS the Transportation Conformity assessment assumes the project is within a current ozone attainment area.

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Because the Wasatch Front is currently an attainment area for ozone, the most recent conformity analyses prepared by WFRC and MAG have not tracked ozone precursors. WFRC's last conformity analysis for ozone precursors was completed as part of the regional transportation conformity analysis in December 2003. That study estimated emissions of 0_3 precursors (NOx and VOCs) for the entire transportation network (including I-15) within Salt Lake

County for the period 2004–2030, and demonstrated that countywide emissions for that period would be less than the allowable transportation-related emission budgets specified by the SIP. Specifically, countywide transportation NOx emissions were forecast to be 38.4 tons per day in 2020, compared to the allowable emission budget of 85.6 tons per day. Similarly, countywide transportation VOC emissions were forecast to be 31.1 tons per day in 2020, compared to the allowable emission budget of 58.7 tons per day

3.8.5.2 Project-Level Carbon Monoxide Hot Spot Analysis

A project-level impact analysis was completed for the following locations, representing the I-15 mainline and two of the most heavily traveled or congested signalized project-influenced intersections:

- Eastbay Boulevard and University Avenue in Provo, which is within the Provo CO maintenance area; and
- I-15 ramps at 800 North in Orem, which is the most heavily traveled and congested intersection outside the CO nonattainment area.

Impact Criteria

An air quality impact would occur if the CO hot spot analysis for Alternative 4 indicated that modeled future CO concentrations at any receptor exceeded either the 1- or 8-hour NAAQS limits (35 ppm and 9 ppm, respectively).

Modeling Results

Table 3.8-9 summarizes the highest modeled CO concentrations (including background) at any receptor location at each subject intersection for 2006 existing conditions and the 2030 design year conditions. The quantitative analysis used the CAL3QHC model to predict worst-case CO concentrations for the existing conditions (2006) and the design year (2030). The modeled values for 2030 are lower than the values for the existing conditions because the regional vehicle fleet is becoming more clean-burning at a faster rate than traffic volumes are increasing. It is recognized that modeled CO concentrations during intermediate "build years" could be higher than either the existing or design year conditions. However, at this time, the specific schedule for constructing the various portions of the proposed project is undetermined, so UDOT has not attempted to develop detailed traffic volume or LOS analyses for each intersection for various intermediate build years. Based on that lack of detailed traffic modeling data, the CO hot spot analysis did not include modeling of intermediate build years.

Table 3.8-9: Carbon Monoxide Hot Spot Modeling Results

Modeled Year	Alternative 1 No-Build		Alternative 4 Preferred Alternative		NAAQS	
	1-Hour (ppm)	8-Hour (ppm)	1-Hour (ppm)	8-Hour (ppm)	1-Hour (ppm)	8-Hour (ppm)
Eastbay Boulevard at University Avenue						
Existing Year (2006)	10.0	6.8	NA	NA	35	9
Design Year (2030)	8.2	5.5	8.5	5.8	35	9
I-15 at 800 North, Orem						
Existing Year (2006)	10.3	7.0	NA	NA	35	9
Design Year (2030)	8.6	5.8	8.5	5.8	35	9

Note: Listed values include background (6 ppm 1-hour and 4 ppm 8-hour, monitored data)
Source: Jones & Stokes 2008

The CO hot spot analysis indicated the following for Alternative 1:

- For 2006 existing conditions, no CO exceedances were modeled at any of the subject intersections.
- For the 2030 design year, no CO exceedances were modeled at any of the subject intersections, and CO concentrations would be less than 2006 existing conditions.

The CO hot spot analysis indicated the following for Alternative 4:

- For the 2030 design year, no CO exceedances were modeled at any of the subject intersections.
- In all cases, the modeled CO concentrations for the 2030 design year were less than 2006 existing conditions. In some cases, the modeled 2030 concentrations for the Preferred Alternative exceeded those for 2030 No-Build, but both are well below the NAAQS.

3.8.5.3 Qualitative Project-Level PM_{10} Assessment

The following discussion in this subsection is a qualitative assessment of the localized PM_{10} hot spot impacts for the Preferred Alternative. Although the project will increase traffic volumes by roughly 7% compared to the No-Build Alternative, it is unlikely that windblown dust generated by construction or traffic on I-15 would cause PM_{10} concentrations near the freeway to exceed the NAAQS. As listed in Table 3.8-6, there are numerous PM_{10} monitoring stations in the general vicinity of I-15. Measured PM_{10} concentrations have generally been well below the NAAQS. The highest PM_{10} concentrations have been measured at the North Salt Lake City monitoring station, which is in an industrial zone adjacent to a major surface mining operation. This is the closest monitored station to a freeway in the Wasatch Front. The measured PM_{10} concentrations at that monitoring station were likely impacted more by local emissions from the adjacent industrial zones than by vehicular emissions from I-15.

UDAQ air quality regulations will require construction contractors to minimize PM_{10} emissions during construction. Construction operations would temporarily increase fugitive dust and construction equipment tailpipe emissions. However, UDAQ Rule 307-309 (Fugitive Emissions and Fugitive Dust) requires construction crews to implement a dust control plan to minimize windblown dust and trackout of mud onto public roads. UDOT's standard design specification to comply with this dust control regulation is described in Section 3.8.6. UDOT generally uses salt, not sand, to control ice accumulation on I-15 during winter.[4] Therefore, silt loadings are minimized along I-15 during winter and spring, when PM_{10} concentrations are generally highest, which reduces fugitive dust emissions and ambient PM_{10} concentrations beyond the freeway right-of-way.

Ambient PM_{10} concentrations in Salt Lake County and Utah County are caused mainly by secondary particulates generated in the atmosphere by gaseous tailpipe emissions, rather than by windblown primary particulates.[5,6] PM_{10} modeling conducted for the SIP accounted for emissions from I-15 and all other sources in the counties. The SIP for PM_{10} established transportation emission budgets for both primary particulate and gaseous PM_{10} precursors in Salt Lake County and Utah County. The most recent transportation conformity determinations for both counties demonstrated that forecasted emissions of primary windblown dust from roadway projects for the period 2010–2030 are less than the allowable emission budgets set by the SIP (Wasatch Front Regional Council 2006; Mountainland Association of Governments 2007).

[4] Chaney, Jerry. Staff member, Utah Department of Transportation. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

[5] Hardy, Susan. Staff member, Mountainland Association of Governments. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

[6] Barickman, Patrick. Staff member, Utah Department of Air Quality April 26, 2007— Telephone conversation with James Wilder, Jones & Stokes.

3.8.5.4 Qualitative $PM_{2.5}$ Hot-Spot Evaluation

With respect to localized $PM_{2.5}$ hot-spot impacts, the qualitative PM_{10} hot-spot analysis performed for this document provides some insight about likely $PM_{2.5}$ impacts as well. Many of the emission sources that emit PM_{10} also contribute in varying degrees to elevated $PM_{2.5}$ concentrations as well; practically all PM_{10} vehicle exhaust and nitrate particles formed from gaseous NOx emissions are in the $PM_{2.5}$ and smaller size range, while only a small fraction of brake wear, tire wear, and road dust are in that range. As listed in Table 3.8-8, the Preferred Alternative would result in a slight increase in primary $PM_{2.5}$ emissions (tailpipe soot, road dust, tire wear and break wear) compared to the No Build Alternative. However, a large decline in tailpipe emissions (including NOx, the main secondary $PM_{2.5}$ precursor) is projected between the 2005 baseline year and the project design year, which will contribute to reduced concentrations of secondary $PM_{2.5}$. Since most $PM_{2.5}$ in the region is known to consist of secondary $PM_{2.5}$ (Hardy 2007), it is expected that overall $PM_{2.5}$ concentrations caused by vehicular emissions will likely decrease in the future.

3.8.5.5 Regional Trends in Criteria Pollutant and MSAT Emissions

Regional vehicle traffic volumes and regional tailpipe emissions will increase under Alternative 4 compared to Alternative 1, but Alternative 4 regional tailpipe emissions for the 2030 design year are forecasted to be less than 2001 baseline emissions. Table 3.8-8 shows the results of EMIT tailpipe emission modeling for the regional network of project-influenced roadways. As listed in the Net Change columns, daily vehicle travel for Alternative 4 (Preferred Alternative) in 2030 is forecasted to increase by 105%% compared to 2005 baseline conditions, and increase by 7% compared to Alternative 1 (No-Build) conditions. Also, as listed in the Net Change columns, by 2030 the regional criteria pollutant and MSAT emissions for Alternative 4 (Preferred Alternative) would increase by 4% to 8% compared to Alternative 1 (No-Build) conditions. However, increases in VMT between 2001 and 2030 would be more than offset by the steady improvement in emissions from individual vehicles. Therefore, as listed in the Net Change columns, regional MSAT emissions for Alternative 4 (Preferred Alternative) would decrease by 22% to 90%% compared to 2005 baseline values.

3.8.5.6 Nitrogen Dioxide, Sulfur Dioxide, and Lead

There are currently no nonattainment or maintenance areas for NO_2, SO_2, or lead in the study area. Because of their regional nature and the minimal contribution of motor vehicles as a source of these pollutants, it is unlikely that the proposed action would substantially affect concentrations of these pollutants in the study area.

Before about 1990, airborne lead emissions from tailpipes were deposited onto the ground near roadways throughout the United States, including I-15. After leaded gasoline was phased out, lead deposition onto roadways became less of an issue. Regardless, lead concentrations in surface soil near the freeway could be higher than background concentrations, and it is theoretically possible that historically deposited lead on the ground within the I-15 right-of-way could become re-suspended during roadway construction. However, the stringent fugitive dust control measures that will be required by UDOT during construction will ensure that ambient airborne lead concentrations near the construction zones will not approach federal and state air quality limits.

3.8.5.7 Comparison of Design Options

The air quality impacts for Provo/Orem Options B, C and D would be similar to those for Option A. The regional VMT for each option would be similar to Provo/Orem Option A, so the regional tailpipe emissions would also be similar for all options. Therefore, the mesoscale analysis for Option A would also apply for the other design options.

The localized CO hot-spot impacts would be nearly the same for all design options, and in all cases the worst-case CO impacts would be less than the NAAQS. A detailed modeling analysis was done for Option A, and the hot-spot impacts for the other design options were estimated by scaling from the Option A results according to the forecast traffic volumes. The localized CO hot-spot analysis for Provo/Orem Option A was done by conducting CAL3QHC modeling for two of the most heavily traveled and heavily congested intersections within the project area. The hot-

spot impacts at those two intersections for Provo/Orem Option A showed no significant impacts. One of those intersections was Eastbay Boulevard at University Avenue, inside the Provo CO maintenance area. As described in Chapter 2, the Average Annual Daily Traffic (AADT) volumes for the roadway link that includes that intersection differ slightly between the design options. The forecast 2030 AADT for Option A and Option B is the same. The forecast AADT for Options C and D is 4% higher than Option A. Based on those AADT forecasts, the CO hot spot results for Options C and D were estimating by increasing the modeled CO hot-spot increment by 4%. As shown in Table 3.8-10 the estimated CO hot-spot impacts for all design options are lower than the NAAQS.

Table 3.8-10: CO Hot-Spot Analysis for Design Options for Eastbay Boulevard at University Avenue

	1-Hour CO (ppm)	8-Hour CO(ppm)
Option A (using CAL3QHC)	9	6
Option B (same AADT as Option A)	9	6
Option C (AADT 4% higher than Option A)	9	6
Option C (AADT 4% higher than Option A)	9	6
NAAQS	35	9

Note: Listed concentrations include background values (6 ppm for 1-hour and 4 ppm for 8-hour)

The air quality impacts are expected to be similar for American Fork Options A, B, and C. None of the American Fork intersections associated with the design options would have 2030 traffic volumes or LOS high enough to be selected for the worst-case CO hot-spot modeling. Therefore, it is unlikely that slight variations in future traffic volumes for the design options would cause the CO hot-spot impacts in American Fork to exceed the NAAQS.

3.8.6 Mitigation

The analysis presented in Section 3.8 does not indicate that significant air quality impacts will result from implementing the Preferred Alternative. Therefore, no air quality mitigation measures (other than compliance with applicable regulations) are warranted. To minimize fugitive dust during construction activities, as required by UDAQ Rule 307-309 (Fugitive Emissions and Fugitive Dust), the UDOT Specification Section 01572, (Dust Control and Watering) will be included in the project construction plans and design specifications. The contractor will also adhere to any local ordinances, if applicable.

3.8.7 Transportation Conformity

As noted above, USDOT is required to make a project-level conformity determination before approving this project. A draft conformity determination will be completed for the FEIS for this project, with a final conformity determination being made as part of the Record of Decision.

3.9 Visual Quality

FHWA visual quality assessment techniques and UDOT policies were used for guidance to assess potential visual impacts in the project corridor. The viewshed for the I-15 highway varies throughout the corridor. Existing land uses and the natural landscape were considered in the definition of existing visual character and quality and to provide the context for assessing impacts of the alternatives. Photographs at representative locations along I-15 and the aerial mapping were used to provide a qualitative description of potential visual changes associated with the proposed improvements. Potential impacts are discussed in terms of views of I-15 from adjacent properties and views from I-15 by travelers on the freeway.

Within each of the four geographic sections defined for the I-15 corridor, representative viewshed locations were selected for visual quality analysis, including views facing toward the highway from nearby locations. The affected environment is described through the use of terms identified in the FHWA guidance on visual quality assessment including the following elements:

Vividness: The memorability of the visual impression created by contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Intactness: The integrity of the visual order in the natural and human-created landscape, and the extent to which the landscape is free from visual encroachment.

Unity: The degree to which the landscape's visual resources join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

Views are described looking from the existing freeway, and looking toward the freeway from adjacent parcels or roads. Where applicable, foreground or close-in views, middleground, and background or distant views are described. Figure 3.9-1 shows the geographic sections and view points.

3.9.1 Affected Environment

The overall visual quality of I-15 is considered average for a highway corridor and for highway interchange areas. No views of the highway are particularly memorable or distinctive and would therefore not rate highly in the vividness category. However, certain views from I-15 are memorable and distinctive because they often include distant views of the Wasatch Mountains, Utah Lake, and patches of farmland and open space and have contrasting landscape elements. Such views do form a somewhat "striking and distinctive pattern" in concert with one another, as a defined requisite for vividness according to FHWA's key concepts of visual quality (FHWA, 1988).

3.9.1.1 South Utah County Section

Views of the I-15 corridor between the South Payson Interchange and the University Avenue Interchange are characterized by the freeway in the foreground, open spaces in the middle ground and mountains in the background. Figures 3.9-2 and 3.9-3 show representative views of this section of the I-15 corridor.

I-15 has two lanes in each direction between the South Payson Interchange and the Spanish Fork Main Street Interchange. Visual elements in this section include sparsely vegetated grasslands with low-lying shrubs and trees; areas of residential development immediately adjacent to the I-15 right-of-way and usually facing away from the highway; intermittent open spaces; large scale commercial/light industrial developments; freeway overpass and underpass structures; commercial signage including billboards near the right-of-way; utility and light poles; and areas of agricultural land characterized by flat, geometric green patches.

Between the Spanish Fork Main Street Interchange and the University Parkway Interchange, there are three lanes of traffic in each direction such that the I-15 appears wider and has a larger overall footprint. The area is similar,

visually, to the more southern section, with the major difference being the additional lane which increases the surface area of the highway. Views from I-15 include increased visual clutter associated with more dense and diverse development adjacent to the freeway. As the I-15 north and southbound lanes are closer to one another, the freeway corridor appears more urbanized. Pockets of wetlands are visible along the edge of the travelways and are more prominent at the interchanges. Other visual elements include earthen berms adjacent to the highway, some with trees which somewhat obstruct the distant views of the Wasatch Mountains, as well as more numerous billboards, commercial signs and overhead utility infrastructure.

The overall visual quality of the South Utah County section of the project corridor is considered average for a highway corridor and for highway interchange areas.

As the section is characterized by intermittent residential, commercial and light industrial uses, as well as patches of trees and vegetation among an arid landscape backdrop, the area does not possess a high level of intactness, particularly from the two view sheds at the North Payson Interchange and the Spanish Fork Main Street Interchange. These interchanges, particularly the Spanish Fork Main Street Interchange, possess a significant amount of existing visual encroachment. FHWA's other key concept of unity, or "the degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern" is not seen at a high level at either of the typical interchanges in the south section. The open spaces near the North Payson Interchange provide visual contrast from I-15 and are sparsely vegetated. The Spanish Fork Main Street Interchange is similar in that there is a lack of harmony between the highway, natural and landscaped vegetation and adjacent commercial development.

3.9.1.2 Central Utah County Section

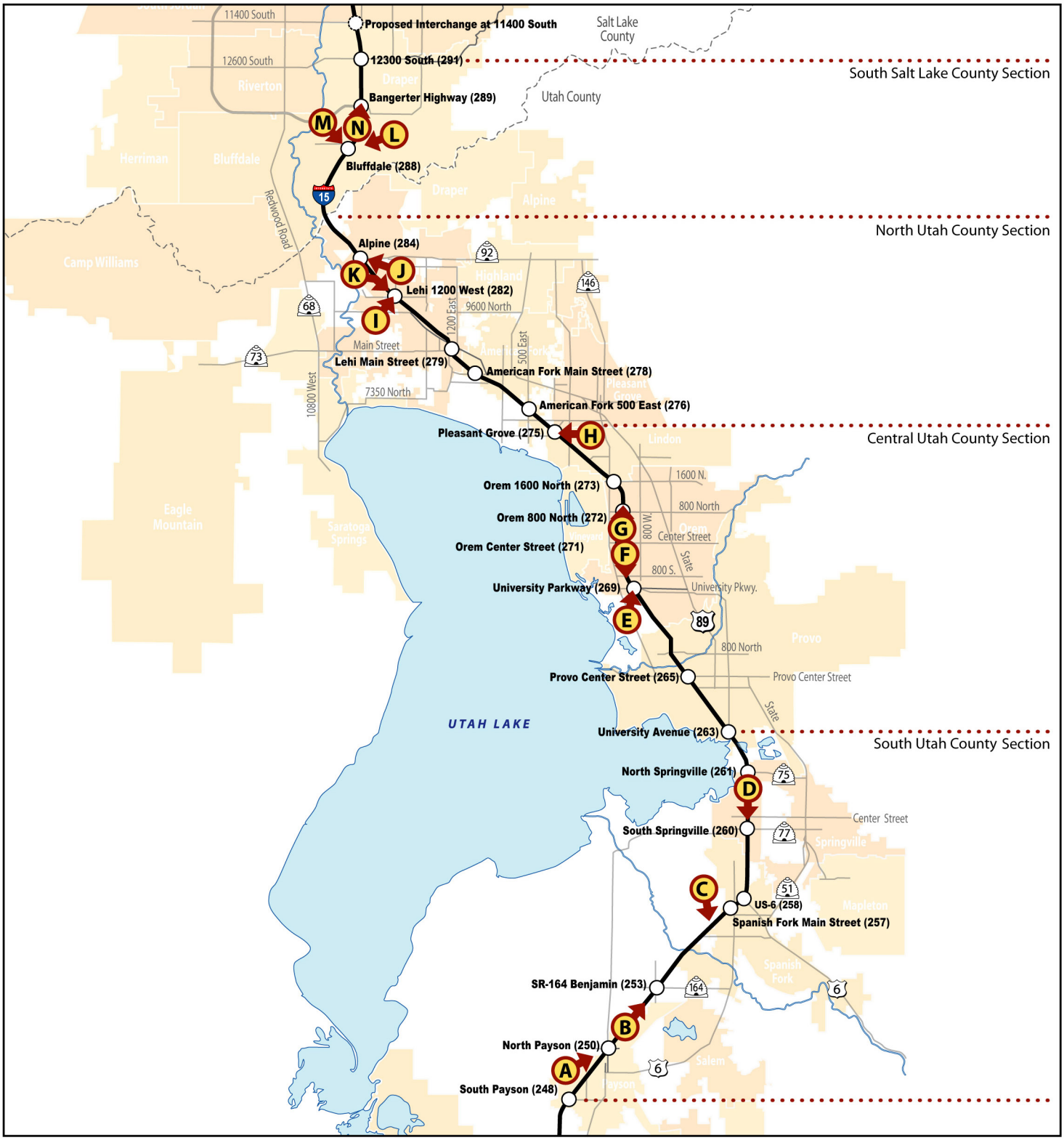
The Central Utah County section of I-15 passes through the cities of Provo and Orem such that the visual context of the freeway is one of an urbanized area. Figures 3.9-4 and 3.9-5 show representative views of this section of the I-15 corridor.

Typical foreground views from I-15 are dominated by the freeway asphalt travel lanes and shoulders extending to a gravel right-of-way. These views transition to middle ground views that include signs and commercial and residential buildings near the I-15. Trees, shrubs, and fencing are visible near developed areas. Frequent middle ground views also include roadway signs, billboards and commercial signage, power lines and poles, freeway light poles and freeway overpasses. Trees and rooftops are visible in background views. Distant mountain views are frequently visible from I-15. Utah Lake to the west can be seen from elevated portions of I-15.

Views toward/from adjacent properties vary according to whether the freeway is elevated, at-grade, or depressed. Because much of the I-15 follows the existing flat topography, some portion of the freeway is generally in view from most adjacent areas. Typically, foreground and middle ground views from the properties adjacent to I-15 include views of nearby roads, light poles and roadside vegetation including trees, shrubs and grasses.

The overall vividness of views in this section is average as the adjacent land uses are mixed and there is a lack of distinctive landscape elements. This is particularly true of the foreground and middle ground views. Background views in most instances are dominated by distant, but very visible mountain ranges. These views characterize much of the I-15 corridor and provide a striking landscape element in contrast to the less vivid urbanized middle and foreground views.

Visual unity is lacking in that visual harmony, particularly in the foreground and middle ground views, is often interrupted by different human-created features in this generally urbanized area of the I-15 corridor.



LEGEND:

A - N Viewpoints

Figure 3.9-1

Viewpoint Locations and Directions

N

VIEWPOINT A VIEW OF NORTH PAYSON INTERCHANGE AREA FROM MAIN STREET, PAYSON (SOUTH UTAH COUNTY SECTION)

VIEWPOINT B VIEW FROM NORTHBOUND I-15 (SOUTH UTAH COUNTY SECTION)

Figure 3.9-2

Viewpoint Locations A & B

VIEWPOINT C VIEW OF SPANISH FORK MAIN STREET INTERCHANGE AREA FROM MAIN STREET, SPANISH FORK (SOUTH UTAH COUNTY SECTION)

VIEWPOINT D VIEW FROM SOUTHBOUND I-15 (SOUTH UTAH COUNTY SECTION)

Figure 3.9-3

Viewpoint Locations C & D

VIEWPOINT E VIEW OF UNIVERSITY PARKWAY INTERCHANGE AREA FROM 1410 SOUTH, OREM (CENTRAL UTAH COUNTY SECTION)

VIEWPOINT F VIEW FROM SOUTHBOUND I-15 (CENTRAL UTAH COUNTY SECTION)

Figure 3.9-4

Viewpoint Locations E & F

VIEWPOINT G VIEW FROM NORTHBOUND I-15 (CENTRAL UTAH COUNTY SECTION)

VIEWPOINT H VIEW OF PLEASANT GROVE INTERCHANGE AREA, PLEASANT GROVE (CENTRAL UTAH COUNTY SECTION)

Figure 3.9-5
Viewpoint Locations G & H

3.9.1.3 North Utah County Section

Views from I-15 in the north section are similar to the other sections and are dominated by travel lanes, medians and shoulders in the foreground. Figure 3.9-6 and View K on Figure 3.9-7 show representative views of this section of the I-15 corridor. Visual elements include freeway overpasses, power lines, power poles, freeway light poles, and billboards. Varying views of wetlands along the edge of the travelway, commercial or residential buildings, trees, shrubs and grasses are visible in the middle ground. These views transition to distant views of building roofs, vegetation, and mountains in the background. Utah Lake to the west can be seen from elevated portions of I-15.

Overall vividness is average for foreground and middle ground views in most of this section. Areas where background views are dominated by mountains do provide a more memorable element for freeway travelers, particularly south bound travelers entering Utah County as they are presented with a view of the entire valley including Utah Lake, mountains to the east and west, rural and urbanized areas in between. Visual integrity and unity diminish as lands adjacent to the freeway are developed. Development is interspersed with views of trees and shrubs, or grasses and desert soils in other areas.

The views towards I-15 from adjacent properties include views of buildings or vegetation that partially obscure the freeway.

3.9.1.4 South Salt Lake County Section

Views from I-15 to the west are of a relatively undeveloped portion of southern Salt Lake County as I-15 passes Point of the Mountain. North of Point of the Mountain, the views are of a fully urbanized landscape with distant views of the Wasatch Mountains to the east, Oquirrh Mountains to the west, and the Great Salt Lake in the far distance. As I-15 follows the contour of Point of the Mountain and is at a higher elevation than the surrounding valley, views from I-15 to the west, north and south are expansive and extend in excess of 10 miles. Figures 3.9-7 and 3.9-8 show representative views of this section of the I-15 corridor.

3.9.2 Impacts of Alternatives

In evaluating the potential visual impacts of the I-15 alternatives, UDOT's adherence to the principles of Context Sensitive Solutions were considered. The three guiding principles are: 1) address the transportation need, 2) be an asset to the community, and 3) be compatible with the natural and built environment. UDOT has achievement criteria for each of these principles. The criteria that most apply to the visual environment are to minimize intrusion and to be aesthetically appropriate.

3.9.2.1 Alternative 1: No Build

Alternative 1 would not have any impacts on the existing visual quality along I-15. Although the visual quality of the highway corridor for travelers on I-15 may change over time, this would result from changes to existing land uses along the corridor and would not be the result of Alternative 1.

3.9.2.2 Alternative 4: I-15 Widening and Reconstruction

Alternative 4 would add new human-created elements to the visual setting along I-15. These elements include retaining walls, frontage roads, new interchanges and overpasses, and noise barriers. Depending on the location, these elements may be visible to travelers on I-15 as well as to viewers from adjacent properties. Potential visual quality changes associated with these improvements are discussed by geographic section. Visual impacts would vary by the magnitude of change, the visibility of change and the existing conditions at various locations.

The noise barrier heights and lengths are those generated by the analysis conducted using the TNM noise model and described in Section 3.7 of this chapter.

VIEWPOINT I VIEW OF LEHI 1200 WEST INTERCHANGE AREA FROM 1900 NORTH, LEHI (NORTH UTAH COUNTY SECTION)

VIEWPOINT J VIEW OF ALPINE INTERCHANGE AREA FROM FRONTAGE ROAD, LEHI (NORTH UTAH COUNTY SECTION)

Figure 3.9-6

Viewpoint Locations I & J

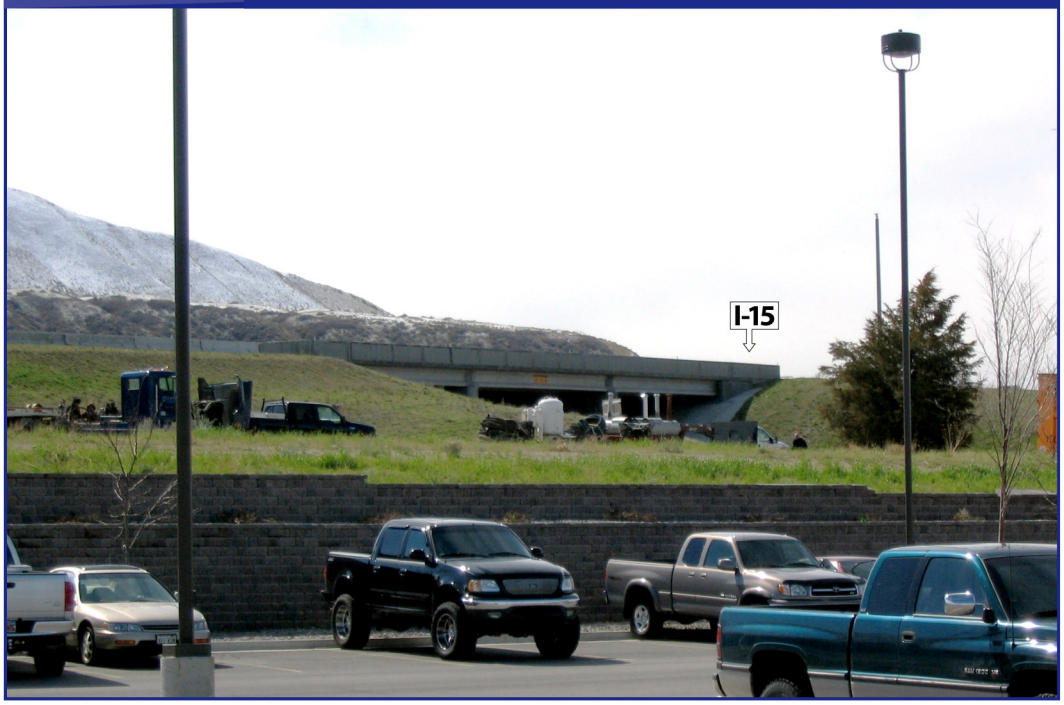
VIEWPOINT K VIEW FROM SOUTHBOUND I-15 (SOUTH SALT LAKE COUNTY SECTION)

VIEWPOINT L VIEW OF 14600 SOUTH INTERCHANGE AREA FROM MINUTEMEN DRIVE, DRAPER (SOUTH SALT LAKE COUNTY SECTION)

Figure 3.9-7

Viewpoint Locations K & L

VIEWPOINT M VIEW OF 14600 SOUTH INTERCHANGE AREA FROM PONY EXPRESS ROAD, DRAPER (SOUTH SALT LAKE COUNTY SECTION)



VIEWPOINT N VIEW FROM NORTHBOUND I-15 (SOUTH SALT LAKE COUNTY SECTION)

Figure 3.9-8

Viewpoint Locations M & N

South Utah County Section

In this section of I-15, the principle visual impact would result from the addition of noise barriers. Three noise barriers are needed to provide noise attenuation for this section of I-15, as shown in Table 3.7-8 in Section 3.7.4 Noise Mitigation. The barriers would be located on both sides of I-15. Two of these barriers would be 12 feet high while the third would be 8 feet high. The longest would be over 8,000 feet while the others would be 3,585 feet and 3,844 feet in length. They would generally be constructed at the edge of the I-15 mainline and/or its access ramps.

For properties that currently abut I-15, these noise barriers would introduce a new and very visible infrastructure to their views of I-15. Travelers on I-15 would have their views of the valley to the west and the Wasatch Range to the east reduced by the new barrier. The visibility of billboards from I-15 would also be reduced by the noise barriers.

The addition of travel lanes would introduce a minor new visual element as they are an extension of the existing I-15 infrastructure and represent an increase in paved area. Alternative 4 would remove existing vegetation within the existing right-of-way but would be replaced by appropriate and sustainable landscaping. These changes would not be substantial as they are modifications to existing visual elements associated with I-15.

The realignment, reconfiguration and/or reconstruction of the I-15 interchanges including the North Payson Interchange, the SR-164 Benjamin Interchange, the US 6 Interchange, the South Springville Interchange and the North Springville Interchange would increase the visibility of the interchange infrastructure to adjacent properties. This reconstruction would widen the footprint of the I-15 interchanges, bringing the freeway infrastructure closer to adjacent land uses.

Central Utah County Section

The Preferred Alternative includes Option C at American Fork Main Street, and Option D in the Provo/Orem area as The Preferred Alternative does not include frontage roads addressed below in Options A and B, nor the Orem 800 South interchange in Options A and C. For comparative purposes, these elements of other options are discussed below.

Noise barriers, the addition of a frontage road system and a new 800 South interchange under Options A and B, and the larger footprint of the reconstructed I-15 would be substantial changes to the existing visual environment along I-15 in the Provo and Orem area.

With the addition of frontage roads under Options A and B, and a new 800 South interchange under Options A and C, the views from I-15 would be changed in that the freeway infrastructure would occupy more of the foreground views. Views of I-15 from adjacent properties would include highway infrastructure that would be much wider than the existing condition. For I-15 users, foreground views of Options A and B would include more roadway infrastructure compared to existing or Alternative 1 conditions.

Many of the proposed I-15 on-ramps and off-ramps would be constructed where existing roads are already present. As a result, Options A and B under Alternative 4 would reinforce the presence of these features rather than introduce new pavement to areas where roadway elements are not already present. As the 1200 North underpass and the 800 South interchange are new additions to the freeway, they would introduce substantial new visual elements for adjacent land uses.

Representative view locations near where I-15 improvements are proposed were used to analyze potential impacts for viewers looking toward the freeway. In many of these view locations, I-15 is not in the foreground and the changes would not be as visually apparent as they would be for properties immediately adjacent to the freeway.

More substantial visual impacts would occur under Provo/Orem Options A and B which would include construction of a new frontage road system. Frontage road locations would affect existing views from nearby areas. For example, in the North and Sunset neighborhoods of Orem, 1200 West would be realigned east of the Orem Center Street Interchange requiring removal of existing homes and buildings. This change in alignment would disrupt the existing

visual unity of the adjacent neighborhood. The new road would require displacing a portion of an existing Utah Valley State College parking lot. It would also pass through a vacant area in front of existing homes and thus add another human-made feature.

In the Fort Utah neighborhood of Provo, Alternative 4 would require the displacement of existing mobile homes and established vegetation near the I-15 right-of-way. This would extend the freeway closer to the neighborhood and open new views toward the freeway for the remaining homes. Just to the north in the Lakeview South neighborhood, there would be less impact. Proposed improvements would occur approximately 300 feet east of the nearest homes in this location and would not greatly alter existing views toward the freeway.

Under Options A and B, where new access roads would be needed to and from frontage roads, the introduction of new paved surfaces would add additional human elements to the existing visual setting. For some neighborhoods this would lead to a greater visual encroachment of roadway-related uses, resulting in an increase in urbanized character. The introduction of new or additional paved surfaces may also decrease the visual unity and intactness of residential settings by removing homes or buildings and increasing the presence of the transportation network.

Under Options C and D these potential visual impacts would be less since new frontage roads, and accompanying access roads, would not be constructed. The construction or improvement of on-ramps and off-ramps in these areas may add new human-created features to the visual setting. Overall, these features would be less visible and contribute less to changes in the visual setting than would the creation of new frontage roads in this section.

The existing Provo Center Street viaduct over the railroad track and the existing southbound I-15 to eastbound Center street flyover would be removed. The removal of these two very visible elevated structures would reduce the visibility of the I-15 infrastructure at these locations. The proposed 1200 West realignment near Orem Center Street would introduce a new roadway that would be very visible to the adjacent residential community.

The University Parkway and University Avenue interchanges were constructed including visual design elements developed through UDOT's CSS planning process. With the improvements to these interchanges in Alternative 4, some of these elements would be removed.

Long sections of noise barriers are warranted through the Provo and Orem area. Eight noise barriers were found to be reasonable and feasible for this section of I-15 (see Section 3.7.4 of this Chapter); two of these barriers would replace existing noise barriers. The TNM analysis showed that the needed barriers would range in height from 8 feet to 16 feet high. These barriers would extend from about 1,000 feet long to almost 11,000 feet or two miles long. Table 3.7-9 in Section 3.7.4 provides the detail on each barrier. The barriers would generally be constructed on the edge of shoulder of the I-15 mainline.

Properties that are adjacent to existing noise walls in Alternative 4 would continue to have views of the I-15 noise barriers as the existing barriers would be replaced. The six new barrier placements would introduce a new and very visible infrastructure that is integrated into the overall view of the I-15 freeway. Travelers on I-15 would have their views of the valley, Utah Lake and mountains reduced by the new barriers. The visibility of billboards from I-15 would also be reduced by the noise barriers.

North Utah County Section

Required noise barriers would be the major source of visual impact in this section. Five noise barriers will be required including 6400 feet of eight-foot-high barrier, over 12,000 feet of ten-foot-high barrier, two 12-foot-high barriers measuring 7830 feet and 3700 feet in length, and an 18-foot-high barrier almost 1000 feet in length.. The new barriers would introduce a new and very visible infrastructure that is integrated into the overall view of the I-15 freeway. Travelers on I-15 would have their views of the valley, Utah Lake, the western mountains, and the Wasatch Ranges reduced by the new barriers. The visibility of billboards from I-15 would also be reduced by the noise barriers. Properties adjacent to I-15 would have views of the new noise barriers that are major visual element additions to their existing views of I-15.

Interchange modifications would occur at the Pleasant Grove, American Fork Main Street, Lehi Main Street, Lehi 1200 West and Alpine Interchanges. A new single-point urban interchange would be provided in North Lehi. Along the freeway the main impact would occur to foreground and middleground views where additional human-created features such as new travel lanes, ramps and overpasses would be most visible. Because the freeway dominates existing views along the freeway this would not substantially alter I-15 users' views from the freeway.

The Pleasant Grove interchange was constructed with visual design elements developed through UDOT's CSS process. These elements would be removed with the interchange reconstruction.

Options A, B and C for the American Fork Main Street interchange would have similar visual impact in the vicinity of I-15. All three would reconstruct the existing interchange such that adjacent properties would continue to have views of highway infrastructure. Looking toward the freeway, potential changes to the visual setting would not be substantial as the I-15 infrastructure would not be in the foreground of most viewers. Properties immediately adjacent to I-15 would continue to have freeway infrastructure in their foreground views.

As all three options extend Main Street westward, this would introduce new roadway features and infrastructure into the view of properties immediately adjacent to the extended Main Street.

South Salt Lake County Section

A new noise barrier would have the most visual impact on this section of I-15. One 8,000-foot long 12-foot high barrier is warranted in this section. It would introduce a new substantive element into the view of the I-15 freeway and would restrict the east and west views of travelers from I-15. The visibility of billboards from I-15 would also be reduced by the noise barriers.

Widening of the existing I-15 mainline and interchange modifications would occur at the Bluffdale, Bangerter Highway, and 12300 South Interchanges. The majority of these improvements would occur within the existing I-15 right-of-way such that foreground and middle ground views of additional pavement would not change the visual character of the existing setting.

3.9.3 Indirect Impacts

Alternative 4 would have no indirect impacts on the visual quality of I-15.

3.9.4 Mitigation

UDOT will apply their Context Sensitive Solutions principles and process to develop appropriate and sustainable landscape treatments and incorporate appropriate aesthetic treatments for the highway design elements, including interchanges, noise barriers, retaining walls, and structures. The visual impact of these structural elements will be mitigated by incorporating architectural design elements that reflect local community or regional characteristics.

In addition to replacing the CSS elements lost with the modifications and/or reconstruction of the University Avenue, University Parkway and Pleasant Grove interchanges, the design of all other reconstructed and new interchanges will follow the CSS principles and process.

Visual impacts will also be mitigated through the use of landscaping to replace natural vegetation and existing freeway landscaping that will be removed as part of the Preferred Alternative.

3.10 Pedestrian and Bicycle Transportation

Pedestrians and bicycles are not permitted on I-15. However, walking and bicycling are important activities and modes of transportation in the vicinity of I-15, particularly in urban areas and in proximity to recreational uses and destinations.

I-15 impedes east-west pedestrian and bicycle movements, as well as travel between two of the most significant recreational pedestrian/ bicycle facilities in Utah County - Utah Lake to the west of I-15, and the Bonneville Shoreline trail system to the east. As a result, pedestrian and bicycle activities are channelized across I-15 within road corridors that pass over or under the freeway, or within stream, irrigation and drainage corridors that pass beneath it.

Pedestrian and bicycle facilities are composed of various trails, sidewalks, routes and pathways. For the purposes of this assessment, facilities encompass trails, pathways, routes and sidewalks which currently exist, in addition to those that are planned for the future. Some are single-use facilities, while others accommodate multiple-modes of pedestrian and bicycle activities.

The locations of existing and planned facilities were determined through a review of local jurisdiction master plans and plans prepared by the Mountainlands Association of Governments or Wasatch Front Regional Council.

3.10.1 Existing and Planned Facilities

The existing and planned pedestrian and bicycle facilities were identified through review of County, MPO and local jurisdiction planning documents and examination of aerial mapping for the I-15 project.

3.10.1.1 South Utah County Facilities

As illustrated in Figure 3.10-1, the areas where pedestrian and bicycle facilities cross or are planned to cross I-15 are particularly important when addressing the affected environment. The status of the facilities in this section is described in Table 3-10.1. Each is cross-referenced by a number to Figure 3.10-1.

Table 3-10.1: Existing and Planned Pedestrian and Bicycle Facilities - South Utah County Section

# On Fig. 3.10-1	Facility Name/ Location	Facility Type/Size	Planning Municipality/ Jurisdiction	Existing (E) or Planned (P) Facility	Notes
1	Dry Creek Corridor Trail / Payson South Trail	10' Asphalt Trail (MAG)	Payson	P	To be located within Dry Creek stream corridor.
2	Nebo Loop Scenic Byway Trail	10' Asphalt Trail (MAG)	Payson	P	Probable trail connection to the west.
3	Scenic Ridge Trail	10' Asphalt Trail (MAG)	Spanish Fork	P	To be located within Spanish Fork River corridor.
4	6800 South Trail	Planned Future Trail (MP)	Spanish Fork	P	Existing underpass crossing.
5	300 West Trail	Planned Future Trail (MP)	Spanish Fork	P	Existing underpass crossing.
6	200 E. Trail	Planned Future Trail (MP)	Spanish Fork	P	200 East does not connect at present. Located in complex intersection area.
7	Rail Line Trailway (approximately 200 East 1600 North)	Planned Future Trail (MP)	Spanish Fork	P	To be located within UP Railroad corridor.
8	2700 North Trail	Planned Future Trail (MP)	Spanish Fork	P	Overpass exists.
9	SR 75 / North Springville Exit 261 Hobble Creek Trail	5' concrete Sidewalk 6' Striped Bike lane (MAG)	Springville	E	Recently reconstructed interchange with pedestrian and bicycle facilities.

MP = According to a city master plan MAG = According to Mountainland Association of Governments' plan

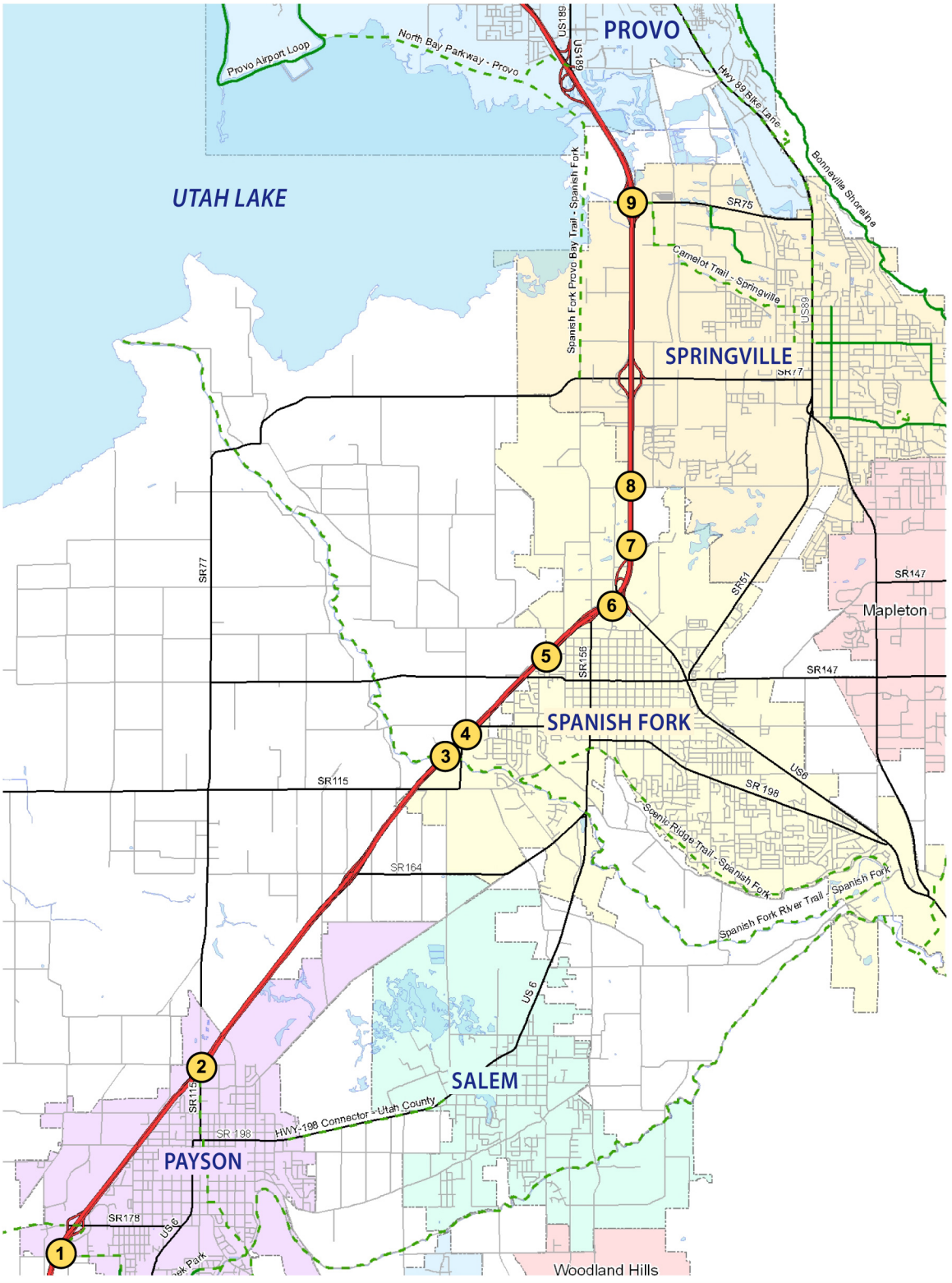


Figure 3.10-1

Pedestrian & Bike Facilities - South Utah County Trails and I-15 Interface

LEGEND:

County Boundary | I-15 | Minor Roadway | Existing Trail

Water Bodies | Major Roadway | Future Trail

N

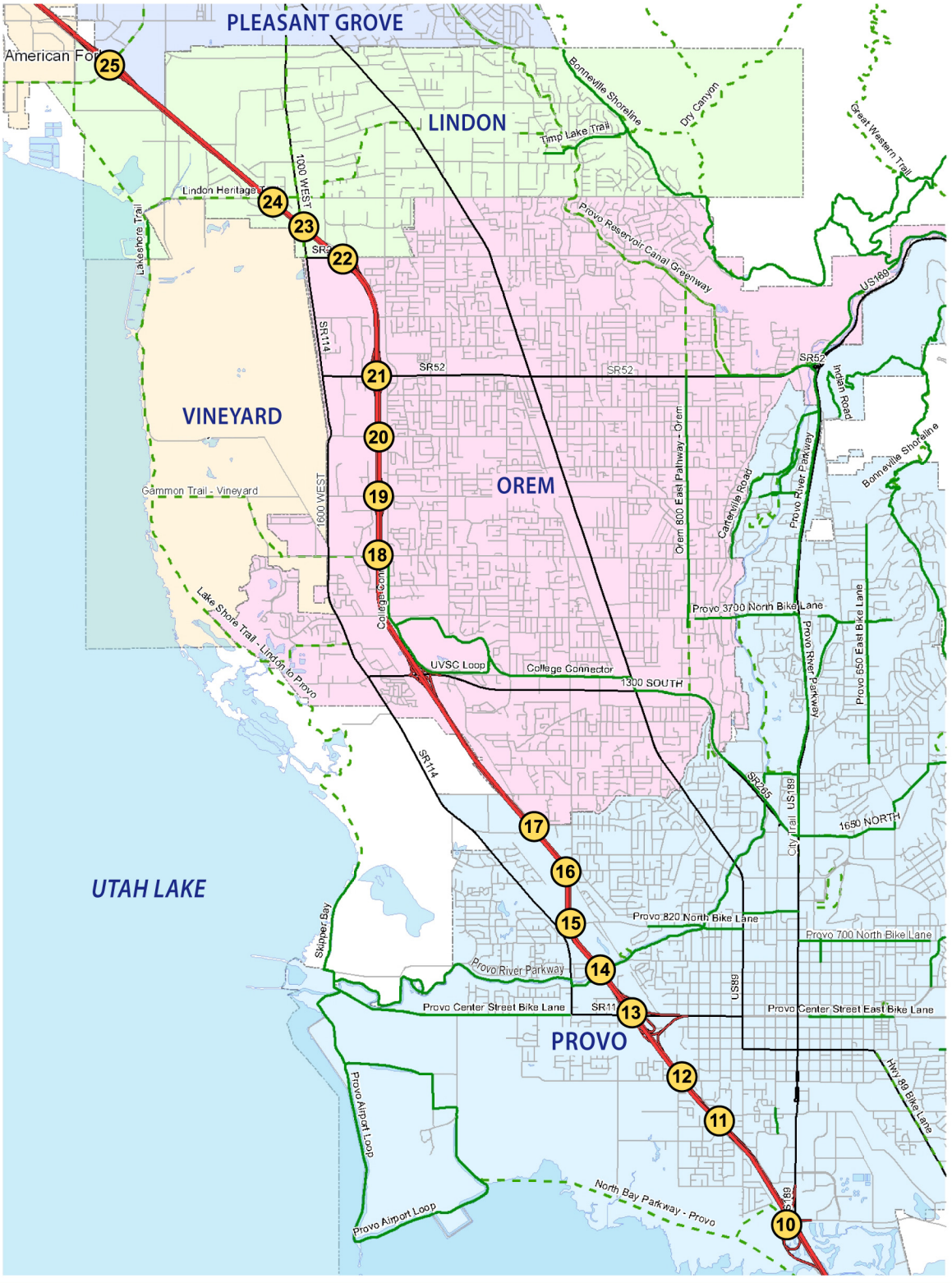


Figure 3.10-2

Pedestrian & Bike Facilities - Central Utah County Trails and I-15 Interface

LEGEND:

County Boundary | I-15 | Minor Roadway | Existing Trail

Water Bodies | Major Roadway | Future Trail

N

3.10.1.2 Central Utah County Facilities

Existing and planned pedestrian bicycle facilities in the Central Utah County Section are shown in Table 3.10-2 and in Figure 3.10-2 on the preceding page.

Table 3.10-2: Existing and Planned Pedestrian and Bicycle Facilities - Central Utah County Section

#	Facility Name/ Location	Facility Type	Planning Municipality/ Jurisdiction	Existing (E) or Planned (P) Facility	Notes
10	University Avenue Exit 263	Proposed Multi-Use Pathways (MP)	Provo	P	Unclear connection. Linkage destination to west is unclear.
11	920 South 770 West Bikeway	Proposed Bikeway (MP)	Provo	P	Existing underpass. Sidewalks exist.
12	600 South Bikeway	Proposed Bikeway (MP)	Provo	P	Existing underpass. Sidewalks exist.
13	Provo Center Street Exit 265	Proposed Multi-Use Pathways (MP)	Provo	P	Reconfigured intersection.
14	Provo River Trail	Existing Multi-Use Pathways (MP)	Provo	E	Located within Provo River corridor.
15	820 South Multi-Use Pathway/Bikeway	Proposed Multi-Use Pathways/Bikeway (MP)	Provo	P	Existing underpass.
16	Rail Line Trailway	Proposed Multi-Use Pathways (MP)	Provo	P	Proposed within existing UP Railroad corridor/ underpass.
17	1680 North (or 2200 South) Bikeway	Proposed Bikeway (MP)	Provo	P	Proposed within new underpass crossing.
18	400 S. Bike Route	Bicycle Route (MP)	Orem	P	Existing underpass.
19	Orem Center Street Exit 271 Bike Route	Bicycle Route (MP)	Orem	P	Reconfigured overpass crossing
20	400 North Bike Lane	Bicycle Lane (MP)	Orem	P	Existing underpass crossing
21	800 North Multi-Use Path	Multi-Use Path (MP)	Orem	P	Reconfigured overpass crossing
22	Orem 1600 North Exit 273	Bicycle Route (MP)	Orem	P	Reconfigured overpass crossing
23	Geneva Road Trail	Regional Trail / 10' Asphalt Trail (MP)	Lindon	P	Existing underpass crossing
24	Timplake Trail Lindon Heritage Trail	10' Asphalt Trail (MAG)	Lindon	P	To be located within undefined stream or drainage corridor
25	Pleasant Grove Boulevard Trail	10' Asphalt Trail (MAG)	Pleasant Grove	P	Probable trail connection to the west utilizing existing overpass crossing

MP =According to a city master plan MAG = According to Mountainland Association of Governments' data

3.10.1.3 North Utah County Facilities

Existing and planned bicycle and pedestrian facilities in the North Utah County section are shown in Table 3.10-3 and in Figure 3.10-3. The Preferred Alternative accommodates a proposed pedestrian crossing at Dry Creek. Lehi City

will be responsible for construction of the trail leading up to the proposed crossing. Coordination will take place between UDOT and Lehi City as the design progresses.

Table 3.10-3: Existing and Planned Pedestrian and Bicycle Facilities - North Utah County Section

#	Facility Name/ Location	Facility Type	Planning Municipality/ Jurisdiction	Existing (E) or Planned (P) Facility	Notes
26	American Fork Center Street Trail / Spring Creek Trail	10' Asphalt Trail (MAG)	American Fork	P	Assumed location within existing American Fork River corridor
27	American Fork Main Street Trail	10' Asphalt Trail (MAG)	American Fork	P	Reconfigured overpass crossing
28	American Fork River Trail	10' Asphalt Trail (MAG)	American Fork	P	Proposed within Mill Pond headwater corridor
29	Historic Utah Southern Railroad Trail	Open Space Trail Corridor (MP) / 10' Asphalt (MAG)	Lehi	P	To be located within UP Railroad Corridor, on east edge of State Street (US 89)
30	Dry Creek Parkway Trail	Open Space Trail Corridor /10' Crushed Stone Trail (MP, MAG)	Lehi	P	To be located within Dry Creek stream corridor, as requested by the City of Lehi.
31	Historic Utah Southern Railroad Trail	Open Space Trail Corridor 10' Asphalt Trail (MP, MAG)	Lehi	P	To be located within UP Railroad corridor
32	Murdock Canal Trail / Provo Reservoir Canal Greenway / Jordan River-Murdock Canal Connector Trail	Open Space/Pedestrian Trail Corridor (MP) 10' Asphalt Trail (MP, MAG)	Lehi	P	Assumed crossing on reconfigured SR-92 overpass crossing

MP = According to a city master plan MAG = According to Mountainland Association of Governments' plan

3.10.1.4 South Salt Lake County Facilities

Existing and planned pedestrian and bicycle facilities are shown in Table 3.10-4 and in Figure 3.10-4. During the public comment period, the I-15 team met with representatives from Draper and Bluffdale to discuss trail connectivity across I-15, and a number of other issues. A trail crossing has been accommodated at 14600 South in Draper, and UDOT will continue to coordinate with the cities as designs progress. Please see the Response to Comments section in the appendices.

Table 3.10-4: Existing and Planned Pedestrian and Bicycle Facilities - South Salt Lake County Section

#	Facility Name/ Location	Facility Type	Planning Municipality/ Jurisdiction	Existing (E) or Planned (P) Facility	Notes
33	Point of the Mountain Trail	Asphalt Trail	Draper and UTA	P	Within existing UTA right-of-way or frontage road Preferred Alternative includes a multi-use undercrossing just south of the 14600 Interchange (See Figure 3.10-4).

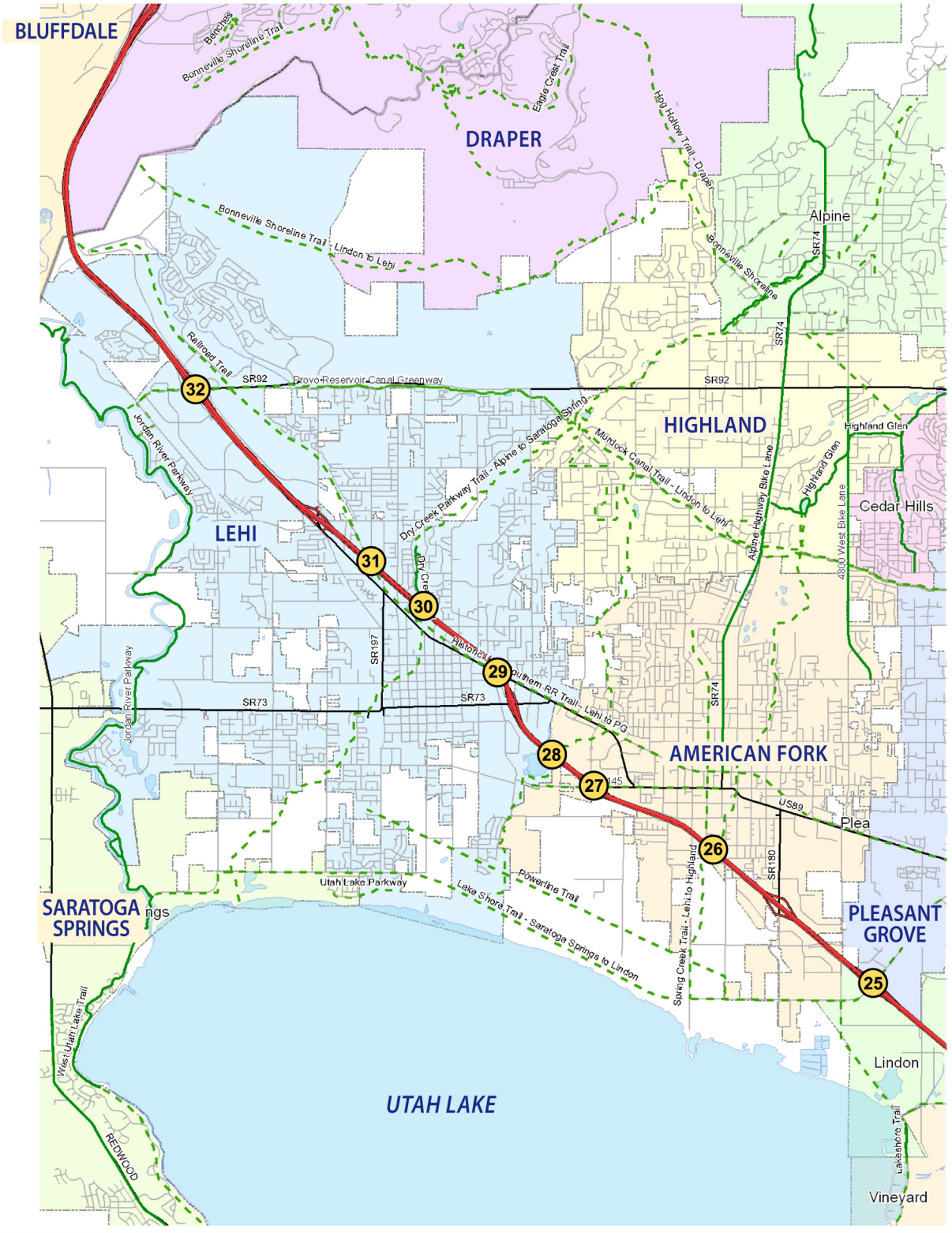


Figure 3.10-3

Pedestrian & Bike Facilities - North Utah County Trails and I-15 Interface

LEGEND:

County Boundary | I-15 | Minor Roadway | Existing Trail

Water Bodies | Major Roadway | Future Trail

N

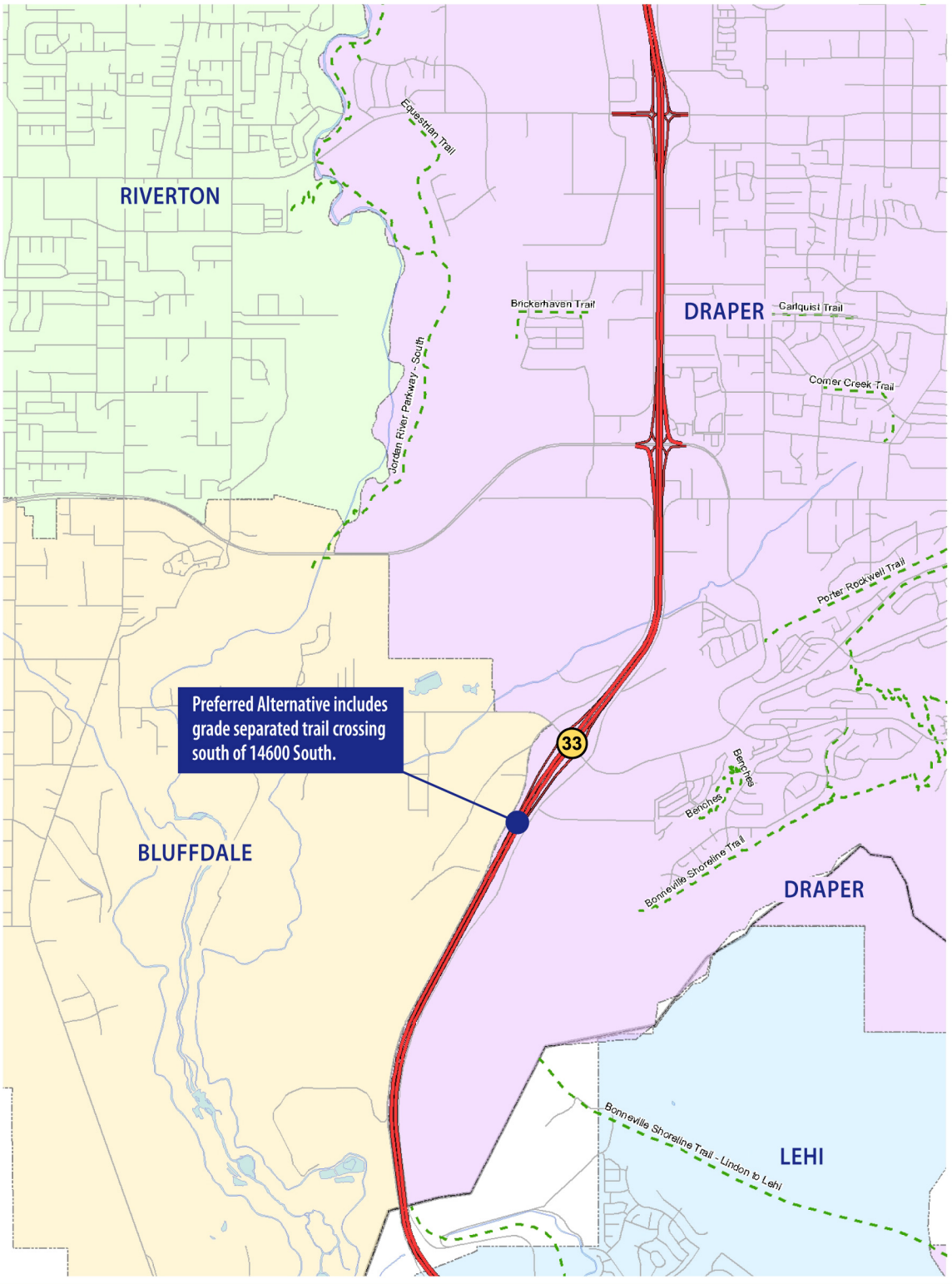


Figure 3.10-4

Pedestrian & Bike Facilities - South Salt Lake County Trails and I-15 Interface

LEGEND:

County Boundary | I-15 | Minor Roadway | Existing Trail

Water Bodies | Major Roadway | Future Trail

N

3.10.2 Impacts of Alternative 1

Alternative 1 would not impact existing pedestrian and bicycle facilities. It would not preclude implementation of planned pedestrian and bicycle facilities but would not facilitate their incorporation into the existing I-15 infrastructure.

3.10.3 Impacts of Alternative 4

Alternative 4 would allow for the existing and planned pedestrian and bicycle facilities that are defined in the WRFC and MAG plans, and in city or county master plans. The detailed configuration of each facility would be determined during final design of I-15. Proposed facilities that would use stream, canal and drainage corridors to cross I-15 would be allowed for in the design of I-15 such that sufficient room between bridge abutments over these water courses would accommodate a multi-use pathway. Pedestrian and bicycle facilities proposed for new and reconfigured I-15 interchanges would be implemented as part of the project. Those bicycle and pedestrian facilities that do not cross I-15 would not be implemented as part of the I-15 project.

In Central Utah County, the existing Provo River Trail connection beneath I-15 would be maintained and reconstructed. The frontage road alternatives (Provo/Orem Option A and Provo/Orem Option B) include sidewalks on each of the cross streets: Provo Center Street, Provo 820 North, Provo 1740 North, and Provo 2000 North/Orem 2000 South. Options A and C include a new Orem 800 South interchange that would provide a new opportunity for pedestrians and bicyclists to cross I-15. Option B does not include the 800 South interchange and therefore would not provide this additional crossing opportunity.

There are no differences in impacts to pedestrian and bicyclist facilities among the design options in the American Fork Main Street design options (A, B, and C).

In South Salt Lake County, the Point of the Mountain Trail would be incorporated into the combined design of Alternative 4 and the parallel north/south frontage road on the east side of I-15.

3.10.4 Indirect Impacts

Provision of pedestrian and bicycle connections across I-15 may have an indirect impact. Cities adjacent to I-15 may be encouraged to implement their planned pedestrian and bicycle connections on either side of these I-15 crossings.

3.10.5 Mitigation

The final design of each I-15 interchange will provide for east/west pedestrian/bicycle access across I-15. The type of facility will be determined during design and may be a multi-use sidewalk, a sidewalk for pedestrians, and/or on-street lane for bicyclists. Although MPO and local plans do not show I-15 crossings at each I-15 interchange, it is reasonable to provide for a connection across I-15 to facilitate east-west movement and to increase connections between communities. The provision of these connections is consistent with UDOT policy with regard to Context Sensitive Solutions (CSS). The intent of CSS is to offer transportation solutions that help connect communities and improve the quality of life.

3.11 Hazardous Materials

Hazardous materials and potential contaminants must be considered within project alternatives to determine if the potential project is impacted by any identified hazardous material sites. Identification of sites and determination of whether project alternatives would use, generate or store any hazardous materials that may expose construction workers or I-15 motorists to health threats from contaminants is discussed in this section.

3.11.1 Methodology

The existing federal and state environmental databases were reviewed to determine the presence of sites with hazardous material related concerns near the project corridor. The study area for the hazardous materials assessment followed American Society for Testing and Materials (ASTM) Standard search distances for government agency file records of potential contaminant sources (PCSs) in the vicinity of the project area. Government agency files were analyzed to determine the location and extent of potential contamination sources near the project area. Where available, historical and current topographic maps and aerial photography provided detail regarding past and present land use of the project area and the surrounding area. A physical reconnaissance of the project area was used to gather information regarding the presence or absence of conspicuous conditions indicating potential environmental problems. The site visit included a visual survey of properties adjacent to I-15 to identify businesses or features which could have the potential to affect the project area. Analysis included sufficient detail to determine the likelihood that contamination may exist in the project corridor, or close enough to the corridor to have measurable effects. The alternatives discussion includes the location of PCSs and mitigation measures for potential impacts to human health and the environment.

3.11.1.1 Historical Records Review

Historical maps included aerial photographs and historical topographic maps for the years 1972, 1997, and 2006 for the majority of the I-15 corridor (Terra Server, 2006). Historical mapping showed development in and around the project area in a similar state as it is today. Several of the current communities and towns along I-15 were visible for each year reviewed including the towns of Springville, Payson, Orem, Provo, Lehi, and Draper. Much of the development in these areas over the previous 35 years remains similar to their current conditions. The cities along the I-15 corridor contain small to medium-sized commercial and light industrial districts with a limited number of larger industrial facilities located near the project area. Large areas of agricultural and undeveloped land separate the towns along the southern half of the I-15 corridor. A limited number of properties along the I-15 corridor have been historically associated with the use, storage, or generation of hazardous materials and generally present a low risk of contributing to hazardous material being encountered along the project area.

3.11.1.2 Regulatory Review

A review of both federal and state databases was conducted to identify former and current land uses that could result in the contamination of soil and/or groundwater on or adjacent to the I-15 corridor. The objective of this review was to identify and document reported releases of hazardous or toxic materials to the environment and to identify commercial businesses and industries that use, generate, store, transport, or dispose of regulated hazardous materials in the normal course of business.

3.11.1.3 Environmental Database Report

A regulatory database search was conducted consistent with the ASTM requirements for environmental site assessments (ESAs). Environmental Data Resources (EDR) was contracted to provide a comprehensive search of existing environmental regulatory agency databases for known or suspected environmental concerns within the project area. The EDR report includes a list of databases searched, a statistical profile indicating the number of properties within the project area, selected detailed information from federal and state lists, and maps illustrating the identified sites of interest or concern within the project area. The EDR report used for this hazardous materials

assessment is entitled *EDR Data Map Environmental Atlas, I-15 Corridor DEIS, Salt Lake, UT, Inquiry Number 01871877.1r.* Identified sites are located on maps provided by EDR.

The search of publicly available federal, state, and local environmental databases for information on sites includes, but is not limited to, the following operations:

- Location of registered underground storage tanks (USTs) and leaking underground storage tanks (LUSTs)
- Facilities that use, generate, treat, store, or dispose of hazardous wastes and/or substances
- Transporters of hazardous wastes
- Solid waste landfill locations
- Unauthorized spills and releases of hazardous/regulated substances
- Sites undergoing investigations and/or cleanup

The environmental databases searched for this project are summarized in Table 3.11-1. Of the databases searched, special consideration was given to sites identified within the following databases: National Priorities List (NPL), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), No Further Remedial Action Planned (NFRAP) CERCLA, Resource Conservation and Recovery Act (RCRA), LUST sites, and UST sites. Sites identified in these databases are the most likely to contribute to hazardous material conditions at nearby properties.

Table 3.11-1: Environmental Databases Searched

Environmental Databases	
Federal Records	
NPL	National Priority List
Proposed NPL	Proposed National Priority List Sites
Delisted NPL	National Priority List Deletions
NPL Recovery	Federal Superfund Liens
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Info System
CERCLA-NFRAP	CERCLIS – No Further Action Plan Sites
CORRACTS	Corrective Action Report
RCRAInfo	Resource Conservation and Recovery Information System (RCRIS) data recording
RCRIS-LQG	RCRIS – Large Quantity Generator of Hazardous Waste
RCRIS-SQG	RCRIS – Small Quantity Generator of Hazardous Waste
ENG CONTROLS	Sites with engineering controls in place
DOD	Lands owned or administered by the Department of Defense
CONSENT	Superfund Consent Decrees
TRIS	Toxic Release Inventory System
FTTS	Federal Insecticide, Fungicide & Rodenticide Act (FIFRA), TSCA and Emergency Planning and Community Right-to-Know Act (EPCRA) Tracking System
PADS	PCB Activity Database
FINDS	Facility Index System
ERNS	Emergency Response Notification System
HMIRS	Hazardous Materials Information Reporting System

Table 3.11-1: Environmental Databases Searched - continued

Environmental Databases	
Federal Records continued	
FUDS	Formerly Used Defense Sites
US Brownfields	A listing of Brownfields Sites
ROD	Records of Decision
UMTRA	Uranium Mill Tailings Sites
ODI	Open Dump Inventory
TSCA	Toxic Substances Control Act
SSTS	Section 7 Tracking Systems
ICIS	Integrated Compliance Information System
RADINFO	Radiation Information Database
US CDL	Clandestine Drug Labs
LUCIS	Land Use Control Information System
MLTS	Material Licensing Tracking System
MINES	Mines Master Index File
RAATS	RCRA Administrative Action Tracking System
State and Local Records	
SHWS	Utah does not maintain a SHWS list. See Federal CERCLIS and Federal NPL.
SWF/LF	Solid Waste Facilities/Landfill Sites
LUST	Leaking Underground Storage Tank Sites
UST	Underground Storage Tank Sites
LAST	Leaking Aboveground Storage Tank Sites
AST	Aboveground Storage Tank Sites
SPILLS	Spill Incidents reported to the Division of Environmental Response & Remediation
VCP	Voluntary Cleanup Program Sites
DRYCLEANERS	Registered Dry cleaning Facilities
INST CONTROL	Sites with Institutional Controls
NPDES	National Pollution Discharge Elimination System of water quality permits
EDR Manufactured Gas Plants	Compilation of historical Coal Gas Plants (manufactured gas plants)
BROWNFIELDS	Brownfields Assessment Sites Listing
Tribal Records	
INDIAN RESERV	Indian Reservations
INDIAN LUST	Leaking Underground Storage Tanks on Indian Land
INDIAN UST	Underground Storage Tanks on Indian Land

3.11.1.4 Environmental Database Analysis

Sites identified during the environmental database search were screened to determine their potential to impact the project, based on whether they were on or adjacent to I-15, within one-quarter mile, one-half mile, or one mile from I-15. The base screening criteria considered the nature of the database listing (e.g., the occurrence or potential for a contaminant release) and the distance of the listed site from the project alignment. The database review provided a means to evaluate a large number of environmental database sites and to identify the sites that potentially impact the project area.

After the base screening criteria was applied, sites were further evaluated by reviewing the site-specific information provided in the database report to assess the potential for a site to adversely impact construction (e.g., small spill, soil contamination only, case closed, etc.). Following the application of the screening criteria, sites were either no longer considered to impact the project corridor or recommended for further evaluation, including field reconnaissance and, if necessary, regulatory file review. Through the process of identifying and evaluating sites, those sites where environmental contamination was initially perceived, but not identifiable from the database review, were further evaluated during field reconnaissance and, if necessary, regulatory file review.

3.11.1.5 Results of Environmental Database Review

Three-hundred and ten of the 317 sites identified in the EDR Report were reviewed and eliminated from consideration to potentially impact the project area. Reasons for elimination included a site's relative distance from areas that would be disturbed during construction, the identification of no reported releases to the environment at the site, and/or a complete site remediation or a site case closed. The seven remaining sites were further evaluated during the site reconnaissance. Tables 3.11-2 through 3.11-5, provide detail on the seven potential contamination sites identified in the EDR Report by I-15 Corridor geographic sections.

The location of 1,840 additional sites identified in the report was not adequately documented or considered incomplete; these sites were not mapped within the EDR reports. The 1,840 unmapped sites were reviewed and eliminated based on each site's relative distance from the project area and/or no documented environmental releases at the site. The distance between each site and the project area was determined by mapping site addresses provided in the EDR Report.

3.11.1.6 Site Reconnaissance of the Project Corridor

A site reconnaissance was performed on April 24 and 25, 2007 to identify any current uses in the I-15 Project corridor likely to involve the use, treatment, storage, or disposal of hazardous materials and to verify the location of sites listed with the environmental database report associated with the regulatory review. The site reconnaissance included locating sites that were identified in the EDR Report, but due to inadequate addresses, were not located in the report. All observations were from public viewing areas. Detailed site investigations were not conducted.

Based on the environmental database information and site reconnaissance of the project corridor, areas of potential hazardous material concern along the I-15 corridor were evaluated in terms of low, moderate, and high potential for exposure of the public or construction workers to hazardous materials. Two additional PCS sites were identified during site reconnaissance. These sites are described below and are also included in Section 3.11.3, in the discussion of Alternative 4 - I-15 Widening and Reconstruction.

Payson Diesel and a former service station site were included in the list of PCSs based on site reconnaissance activities. Payson Diesel is located at 838 North Main Street in Payson. The property is located just east of the Flying J Service Station, which is east of the North Payson Interchange at Mile Post (MP) 250. Site conditions included soil staining and vegetation loss from vehicle spills and large vehicle maintenance on site. A large number of storage drums and containers normally associated with hazardous materials were located on the Payson Diesel site.

No address was visible at Site 8, Former Service Station, located southwest of the Lehi 1200 West Interchange at MP 282. The former service station building on site appeared to be in use for a construction or landscaping business. Site conditions suggest that underground storage tanks may remain on site. The Former Service Station site is located at or near a future side street included in the I-15 Project that would connect 1200 West to State Street, south of the I-15/Lehi Interchange.

3.11.2 Alternative 1: No Build Impacts

No reconstruction of I-15 would occur; therefore, the potential for generation of or impacts from hazardous materials would not be greater than currently exists. The risk of hazardous materials exposure to the public or construction workers associated would not be greater than currently exists. Freeway response times could be worse under the No Build, due to congestion.

3.11.3 Alternative 4: I-15 Widening and Reconstruction Impacts

The impacts of Alternative 4 are presented in four geographic sections from south to north (South Utah County, Central Utah County, North Utah County, and South Salt Lake County). Figure 3.11-1 locates all PCS sites associated with the I-15 Project.

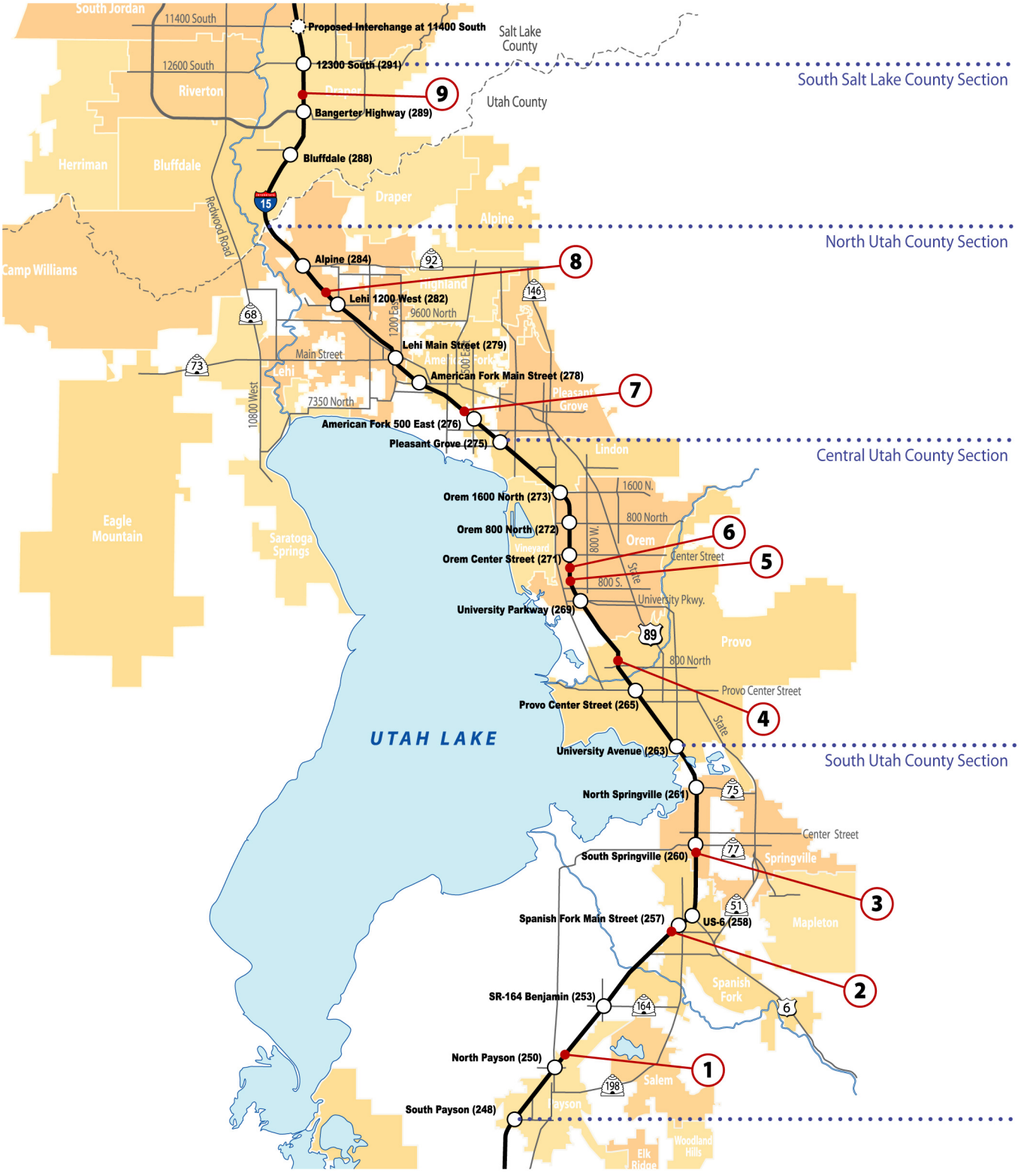
Operational impacts would be the same for all four I-15 corridor sections. Reduced traffic congestion on I-15 may lead to lower accident rates due to better Levels of Service. Lower accident rates may lead to slightly less accidents involving vehicles carrying hazardous materials. No substantial operational effects were identified.

3.11.3.1 South Utah County Section

A low potential for hazardous material impacts to occur exists during the construction of this section of I-15 because of the presence of hazardous materials at a few locations. Three PCS sites (described in Table 3.11-2 and shown in Figure 3.11-1) are located adjacent to or nearby the I-15 Project area and have been identified as having a low potential to contribute to hazardous material conditions along this section of the I-15 Project. PSC sites at or near the project area are related to historic and current site uses and are reasonably predictable sites. The Payson Diesel site appeared to be within the future right-of-way of this interchange.

Construction activities (e.g., grading, drilling, and dewatering) in the area of potential soil and/or groundwater contamination could have an impact on human health and the environment. Grading and dewatering activities in these areas during construction could cause worker exposure to the contaminants. Grading and drilling in areas of contaminated soil and groundwater could mobilize contaminants. If Utah Department of Environmental Quality (UDEQ) or Occupational Safety and Health Administration (OSHA) exposure standards are exceeded, there could be an adverse impact to the public or construction workers at or near the project area.

All structural and property acquisitions have the potential to disturb unidentified hazardous materials contained at these sites, which could affect worker safety and the environment. One hundred sixty-four private or publicly owned parcels would be affected, acquired in full, or involved in partial property acquisitions in South Utah County. Eight buildings would also be displaced.



Scale in Miles
0 1 2 3 4 5

Figure 3.11-1
Hazardous Material Sites

LEGEND:

(1) Potential Contaminant Source Locations

N

Table 3.11-2: Potential Contamination Sources (South Utah County)

Site No.	Site Name / Address	Database Listing [1]	Approximate Distance/Direction from Alignment (Miles)	Site Status
1	Payson Diesel 838 North Main Street Payson, UT 84651 (east of the North Payson Interchange at M.P. 250)	None[2]	On - Adjacent / E	Poor site conditions including soil staining, vegetation loss from vehicle spills, and a large number of hazardous materials containers improperly stored on site. Falls within the Environmental Impact Limits, shown in Volume II.
2	Combo's #2 835 N Main Street Spanish Fork, UT 84660	LUST, UST	0.25 / SE	5 of 10 tanks closed. Visual observation of site was satisfactory. Site is located within ¼ mile of the project. Low potential to impact project
3	South Utah Valley Solid Waste Distribution Springville 2450 W 400 S Springville, UT 84663	SWF/LF	0.15 / E	Site conditions were typical for the type of land use. No reported environmental releases off-site. Site is located within ¼ mile of the project. Low potential to impact project.

Sources:
1. EDR, 2007. Database Listing: Database Listings are defined in Table 3.11-1.
2. Site Reconnaissance, PB, April 2007

3.11.3.2 Central Utah County Section

A low potential for hazardous material impacts to occur exists during the construction of this section of I-15 because of the presence of hazardous materials at a few locations outside the project area. Three PCS sites (described in Table 3.11-3 and shown in Figure 3.11-1) are located near I-15 and have been identified as having a low potential to contribute to hazardous material conditions along this section of I-15. PSC sites near the project area are related to historic and current site uses and are reasonably predictable sites.

Construction activities (e.g., grading, drilling, and dewatering) in the area of potential soil and/or groundwater contamination could have an impact on human health and the environment. Grading and dewatering activities in these areas during construction could cause worker exposure to the contaminants. Grading and drilling in areas of contaminated soil and groundwater could mobilize contaminants. If UDEQ or OSHA exposure standards are exceeded, there could be an adverse impact to the public or construction workers at or near the project area.

Table 3.11-3: Potential Contamination Sources (Central Utah County)

Site No.	Site Name / Address	Database Listing [1]	Approximate Distance/ Direction from Alignment (Miles)	Site Status
4	Ford Construction 820 N 2000 W Provo, UT 84601	CERC-NFRAP	0.25 / E	Owner allegedly buried drums of solvent in a construction landfill. No Further Remedial Action Planned. Site is located within ¼ mile of the project Low potential to impact project.
5	US Steel-Geneva Works 1500 W Center St Orem, UT 84057	Multiple listings that include RCRA-LQG, RCRA-TSD, CORRACTS, CERC-NFRAP	0.25 / W	Multiple environmental violations have occurred at this facility. Corrective actions are in place for irrigation control of groundwater contamination, to control human exposure, and for stabilization. Site determination indicates that migration of contaminated groundwater is under control and monitoring is in place. Site is located within ¼ mile of the project Low potential to impact project.
6	Stesan's Travel Shop 75 N 1200 W Orem, UT 84057	LUST, UST	0.10 / E	6 of 6 tanks closed on site. Visual observation of site was satisfactory[2]. No information was identified that would indicate a large off site environmental release. Low potential to impact project.

Sources:
1. EDR, 2007. Database Listing: Database Listings are defined in Table 3.11-1.
2. Site Reconnaissance, PB, April 2007

All structural and property acquisitions have the potential to disturb unidentified hazardous materials contained at these sites, which could affect worker safety and the environment. A large number of private and publicly owned parcels would be affected, acquired in full, or involved in partial property acquisitions in Central Utah County. Depending on the option in the Provo/Orem area, between 441 and 550 parcels would be affected. Option D (the Preferred option in this area) would affect 446. Between 12 and 43 buildings would also be displaced in this section of I-15. Option D would displace 13.

3.11.3.3 North Utah County Section

A low potential for hazardous material impacts to occur exists during the construction of this section of the I-15 Project because of the presence of hazardous materials at a few locations at or near the project area. Two PCS sites (described in Table 3.11-4 and shown in Figure 3.11-1) have been identified as having a low potential to contribute to hazardous material conditions along this section of the I-15 Project. PSC sites near the project area are related to historic and current site uses and are reasonably predictable sites.

Construction activities (e.g., grading, drilling, and dewatering) in the area of potential soil and/or groundwater contamination could have an impact on human health and the environment. Grading and dewatering activities in

these areas during construction could cause worker exposure to the contaminants. Grading and drilling in areas of contaminated soil and groundwater could mobilize contaminants. If UDEQ or OSHA exposure standards are exceeded, there could be an adverse impact to the public or construction workers at or near the project area.

Table 3.11-4: Potential Contamination Sources (North Utah County)

Site No.	Site Name / Address	Database Listing [1]	Approximate Distance/Direction from Alignment (Miles)	Site Status
7	IBC Advanced Technologies, Inc. 856 E Utah Valley Dr American Fork, UT 84003	FINDS, RCRA-LQG, FTTS	0.25 / NE	Violations at this facility are related to reporting and inspection requirements. No release to the environment was reported. Site is located approximately ¼ mile from project. Low potential to impact project.
8	Former Service Station No Site Address (located SW of Lehi / 1200 W. Interchange at State Street)	None[2]	On – Adjacent / SW	USTs may remain in place on site. Visual observation of site was satisfactory with no indication of a large environmental release. Falls within the Environmental Impact Limits, shown in Volume II.

Notes: Sources:
1. EDR, 2007. Database Listing: Database Listings are defined in Table 3.11-1.
2. Site Reconnaissance, PB, April 2007

All structural and property acquisitions have the potential to disturb unidentified hazardous materials contained at these sites, which could affect worker safety and the environment. A large number of private and publicly owned parcels would be affected, acquired in full, or involved in partial property acquisitions in North Utah County depending upon design option. Between 391 and 417 parcels would be affected, depending upon which of three American Fork interchange options is selected. Option C, the Preferred option in this area, would affect 392. Eighteen or 19 buildings would also be displaced by acquisitions. Option C would displace 19 (See section 3.4).

3.11.3.4 South Salt Lake County Section

A low potential for hazardous material impacts to occur exists during the construction of this section of I-15 because of the presence of hazardous materials at one location outside the project area. One PCS site (described in Table 3.11-5 and shown in Figure 3.11-1) is located near I-15 and has been identified as having a low potential to contribute to hazardous material conditions along this section of I-15. The PSC site is related to historic and current site use and is a reasonably predictable site.

Construction activities (e.g., grading, drilling, and dewatering) in the area of potential soil and/or groundwater contamination could have an impact on human health and the environment. Grading and dewatering activities in these areas during construction could cause worker exposure to the contaminants. Grading and drilling in areas of contaminated soil and groundwater could mobilize contaminants. If UDEQ or OSHA exposure standards are exceeded, there could be an adverse impact to the public or construction workers at or near the project area.

Table 3.11-5: Potential Contamination Sources (South Salt Lake Utah County)

Site No.	Site Name / Address	Database Listing [1]	Approximate Distance/Direction from Alignment (Miles)	Site Status
9	Applied Digital Data Systems Inc. 12953 S State St Draper, UT 84020	FINDS, CERC-NFRAP	Adjacent / NE	No further remedial action planned for the site. No reported release to the environment. Low potential to impact project. Unable to locate physical location based on address[2].

Notes: Sources:
1. EDR, 2007. Database Listing: Database Listings are defined in Table 3.11-1.
2. Site Reconnaissance, PB, April 2007

All property acquisitions have the potential to disturb unidentified hazardous materials contained at these sites, which could affect worker safety and the environment. A number of private and publicly owned parcels would be affected, acquired in full, or involved in partial property acquisitions in South Salt Lake Utah County. Sixty-seven parcels would be affected. No buildings would be affected.

3.11.3.5 Comparison of Impacts -- Alternative 4 Design Options

No sites were identified within .010 miles of the Alternative 4 design options in the Central Utah County and North Utah County sections. With regard to hazardous materials sites, there are no differences among the design options in either the Provo/Orem options area or American Fork Main Street interchange area.

3.11.3.6 Indirect Impacts

Alternative 4 would have no indirect impacts on hazardous material sites in the vicinity of I-15.

3.11.4 Mitigation

For the two sites observed during the site reconnaissance, Site 1 - Payson Diesel, and Site 2 - Former Service Station, a Phase 2 Environmental Site Assessment will be conducted prior to final design and commencement of any construction activities. The results of the Assessment will determine what remediation measures, if any, will be required.

Otherwise, mitigation measures will be the same for all four I-15 geographic sections. In the event that soil and/or groundwater contamination is identified, UDOT (or the construction contractor) will be required to complete a remedial work plan to clean up the site with approval from UDEQ and/or the Environmental Protection Agency.

For structures to be demolished, a pre-construction survey for building materials containing lead-based paint, lead, asbestos-containing materials, and polychlorinated biphenyls (often found in light fixtures) will be conducted and any such materials will be disposed of appropriately.

Unknown contamination could also be encountered during excavation, earthwork, drilling, grading, demolition, and utility work. The contractor will be required to abide by UDOT Standard Specification 01355 – Environmental Protection for the discovery of hazardous materials during construction or of any hazardous materials generated by the contractor. The contractor will be required to develop and implement a project-specific hazardous waste contingency plan prior to construction activities.

3.12 Water Resources

This section discusses water resources (i.e., floodplains, quality of surface water and groundwater, hydrology, and hydrogeology) in the project study area. Floodplains are areas that may become inundated by stormwater runoff during storm events. Encroachment by structures or earthmoving activities into such areas can reduce the flood-carrying capacity and increase flood heights and severity of potential flood-related impacts. This section also discusses floodplains in the project study area, as well as floodplain regulations, and provides information about the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). The water quality portion of this section presents information on state and federal water quality regulations and required permits, and includes a brief discussion on Utah Department of Transportation (UDOT) de-icing practices.

Information and data from multiple documents were used in preparing the water resources assessment. These included:

- FEMA floodplain delineation data
- Federal Highway Administration's (FHWA's) and U.S. Army Corps of Engineers' (USACE's) *Final Legacy Parkway Supplemental Environmental Impact Statement/Reevaluation and Section 4(f), 6(f) Evaluation* (2005)
- Utah Department of Environmental Quality [UDEQ], Division of Water Quality's:
  - *Jordan River Watershed Beneficial Use Classifications (2000)*
  - *Utah Lake–Jordan River Watershed Management Unit Stream Assessment (2002)*
  - *Utah's 303(d) List of Impaired Waters (Final) (2004)*
  - *Utah 2006 Integrated Report Volume I: 305(b) Assessment (2006a)*
  - *Utah 2006 Integrated Report Volume II - 303(d) List of Waters (2006b)*
- Utah Lake watershed analysis prepared by the Great Salt Lake Hydrologic Observatory (2004)

3.12.1 Regulatory Setting

3.12.1.1 Clean Water Act

Water quality is regulated by the federal Clean Water Act (CWA), which was promulgated in 1977. The CWA is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. Three sections of the CWA are applicable to the proposed project:

- Section 401 (state water quality certification);
- Section 402 (National Pollutant Discharge Elimination System [NPDES] permits); and
- Section 404 (permit for discharge of dredged or fill material in waters of the United States).

Permits

The U.S. Environmental Protection Agency (EPA) is the federal agency with regulatory authority for Sections 401 and 402 of the CWA. In July 1987, it delegated portions of this authority to the State of Utah. UDEQ is the governing agency for issues related to water quality, including Section 401 certification and Section 402 NPDES permits. The USACE is the issuing agency for Section 404 permits; Section 404 regulates wetlands, streams, lakes, and other waters of the United States.

Applicants for federal permits for an activity that may result in a discharge of pollutants into a water body must request from UDEQ certification that the proposed activity will not violate state or federal water quality standards. If UDEQ finds that the project is in compliance, then the determination is provided in the form of a Section 401 water quality certification.

Discharge to surface water is regulated through the Utah Pollutant Discharge Elimination System (UPDES) program, which is the state's version of the NPDES program. Construction of the proposed project may include clearing, grading, and excavation activities, which could potentially discharge pollutants to stormwater that ultimately flows into one or more surface waters. Because more than 1 acre would be disturbed, a UPDES permit would be required for the construction phase, including provisions to prevent water quality impacts to stormwater during construction and to prevent stormwater contaminants from entering the permanent drainage system.

Post-construction stormwater runoff from UDOT projects is managed under a statewide individual stormwater permit issued by UDEQ (2003). In compliance with conditions of the permit, UDOT has developed standard construction and post-construction measures to reduce and treat stormwater runoff. UDOT also implements a water quality monitoring program and submits monitoring annual reports to UDEQ.

Clean Water Act Goals

The goals of the CWA are to eliminate the discharge of pollutants into the nation's waters and to achieve water quality levels that are fishable and swimmable. These goals are to be achieved by:

- Requiring major industries to meet performance standards to ensure pollution control;
- Charging states and tribes to set specific water quality criteria appropriate for their water and to develop pollution control programs to meet these criteria, and
- Regulating the discharge of dredge or fill material into waters of the United States.

3.12.1.2 Section 303(d) and the Utah Water Quality Act

Under CWA Section 303(d) and the Utah Water Quality Act (Utah Department of Environmental Quality 2007), the State of Utah is required to establish beneficial uses of state waters and to adopt water quality standards to protect those beneficial uses. Section 303(d) establishes the Total Maximum Daily Load (TMDL) process to assist in guiding the application of state water quality standards, requiring the states to identify streams whose water quality is "impaired" (e.g., affected by the presence of pollutants or contaminants) and to establish the TMDL (e.g., the maximum quantity of a particular contaminant that a water body can assimilate without experiencing adverse effects).

Utah has classified surface waters in the state into Beneficial Use Classifications, as described in Table 3.12-1, *UDEQ Beneficial Use Classifications*, on the following page. Each classification has an associated numerical or narrative standard. The numeric standards consist of limits on concentrations of chemicals and other constituents, in addition to water temperature limitations. The narrative standard is:

> It shall be unlawful, and a violation of these regulations, for any person to discharge or place any waste or other substance in such a way as would be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisances such as color, odor, or taste; cause conditions which produce undesirable aquatic life or which produce objectionable taste in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by bioassay or other tests performed in accordance with standard procedures (Utah Administrative Code, Rule R317-2-7).

The quality of surface waters should meet or exceed the established standards to be safe for their intended uses. UDEQ gives additional protection to maintain the integrity of those waters defined as "high quality waters"; however, there are no designated "high quality waters" in the study area.

Other than the UPDES permit required for construction, UDEQ does not have any specific regulations pertaining to the quality or treatment of runoff from a highway. Utah and Salt Lake Counties defer to UDEQ regulations for water quality issues. Therefore, the Utah Water Quality Act and the CWA are the only regulations applicable to water quality for this project.

Table 3.12-1: UDEQ Beneficial Use Classifications

Classification	Description
1	Protected for use as a raw water source for domestic water systems.
1C	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
2	Protected for recreational use and aesthetics.
2A	Protected for primary contact recreation such as swimming.
2B	Protected for secondary contact recreation such as boating, wading, or similar uses.
3	Protected for use by aquatic wildlife.
3A	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
3B	Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
3C	Protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain.
3D	Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
3E	Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.
4	Protected for agricultural uses, including irrigation of crops and stock watering.
5	Great Salt Lake. Protected for primary and secondary contact recreation, aquatic wildlife, and mineral extraction.

Source: Utah Department of Environmental Quality, Division of Water Quality 2006a

3.12.1.3 State of Utah Stream Alteration Permit (General Permit 40)

A stream alteration permit is required from the Utah Department of Natural Resources, Division of Water Rights, for all activities that affect the bed or banks of natural streams. General Permit 40 covers activities such as bridge or railroad construction and enables the state to have the stream alteration permit fulfill the requirements of CWA Section 404. The state's permit is subject to approval by the USACE. If the USACE determines that a stream alteration permit is not sufficient, an individual Section 404 permit from the USACE also would be required. Projects that require a Section 404 individual permit are those involving wetlands, stream relocation, or the pushing of streambed material against a stream bank using a bulldozer or similar equipment. Stream alteration permits would be required for construction activities that cross any USACE jurisdictional water of the United States.

3.12.1.4 National Flood Insurance Program

Congress responded to increasing costs of disaster relief by passing the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. These acts were intended to reduce the need for large, publicly funded flood control structures and disaster relief by restricting development on floodplains. Under authority from the National Flood Insurance Act, FEMA administers the NFIP and issues flood insurance rate maps (FIRMs) for communities participating in the program.

A total of 14 communities in Utah County and 13 communities in Salt Lake County participate in the NFIP. Communities that participate in the NFIP are required to administer a permit review program based in part on FEMA-generated FIRMs as part of the local land use permitting process to minimize flood damages.

3.12.1.5 Federal Floodplain Regulations

Executive Order 11988 (Flood Plain Management) and 23 CFR 650, Subpart A (Location and Hydraulic Design of Encroachments on Flood Plains), provide guidance to federal agencies on constructing projects within the boundaries of designated floodplains. Executive Order 11988 requires that all federal agencies take action to reduce the risk of flood loss; to restore and preserve the natural and beneficial values served by floodplains; and to minimize the impact of floods on human safety, health, and welfare. Federal agency actions must reflect consideration of alternatives to avoid adverse impacts in floodplains and, where such impacts are unavoidable, must modify the proposed action to minimize such impacts.

23 CFR 650, Subpart A, prescribes Federal Highway Administration (FHWA) policies and procedures for locating and designing highway encroachments in floodplains. 23 CFR 650.111 explains that "National Flood Insurance Program (NFIP) maps or information developed by the highway agency, if NFIP map are not available, shall be used to determine whether a highway location alternative will include an encroachment." Specifically, FHWA must avoid longitudinal or significant encroachments into floodplains, where practicable, and must minimize adverse affects to floodplains resulting from its actions. 23 CFR 650.105(q) defines a "significant encroachment" as a highway encroachment and any direct support of floodplain development that would involve one or more of the following construction- or flood-related impacts:

- a significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route;
- a significant risk; or
- a significant adverse impact on natural and beneficial floodplain values.

A proposed action that includes a significant encroachment cannot be approved unless FHWA finds that the proposed significant encroachment is the only practicable alternative.

3.12.1.6 Local Floodplain Regulations

Local governments often restrict fill within the floodplain through a variety of methods, such as those listed below:

- balancing cut-and-fill whereby the overall flood storage capacity of the floodplain remains constant;
- limiting fill only to the amount necessary for construction of permitted structures;
- limiting the total amount of permitted fill per site; and
- specifying permitted locations of fill on a site (e.g., designating fill for the portion of the lot farthest from the floodplain).

Regulations also center on ensuring that all structures are adequately protected from recurrent flooding:

- Buildings may be required to be floodproofed to within a specified height of flood events. Floodproofed buildings allow no water to enter below the floodproofed height. This typically means that, at or below the specified elevation, there are no entryways or windows and no habitable space.
- Codes can restrict building siting to nonfloodplain lands or portions of the lot with the shallowest potential flooding.
- Minimum buffers or setbacks from water bodies may be used. Buffers should be established based on the capacity of the water body and the slope of the shoreline.
- Some codes limit construction of fences in floodplains so that they do not collect debris or obstruct floodwaters.

One example of these local floodplain protection measures is Salt Lake County's Jordan River Meander Ordinance, which restricts the type of development and land uses in the meander corridor (Salt Lake County 1994).

3.12.2 Affected Environment

3.12.2.1 Utah Lake/Jordan River Basin Hydrology

The proposed transportation corridor traverses the Utah Lake/Jordan River Basin, which consists of two major sub-basins: the Utah Lake and Jordan River watersheds. The Utah Lake watershed includes all of the land that drains into Utah Lake and a portion of the Jordan River originating at the Utah Lake outlet, downstream (north) to the Jordan River Narrows, near the Utah/Salt Lake County line. Utah Lake is one of the largest natural freshwater lakes in the western United States. It occupies much of the Utah Valley and is a major source of water for Salt Lake County. The Jordan River is the only outlet for the lake and drains it north to Great Salt Lake. The South Utah, Central Utah, and North Utah County Sections are located in the Utah Lake watershed.

The Jordan River watershed includes those lands that drain into the Jordan River from the Jordan River Narrows north through the Salt Lake valley to Great Salt Lake. The South Salt Lake County Section is located in the Jordan River watershed.

The Utah Lake/Jordan River Basin is a diverse watershed that contains a variety of soil types and a wide range of vegetation communities that are common throughout the state. Annual precipitation totals vary dramatically because of large differences in elevation between the valley and mountain areas. Average annual precipitation ranges from 12 inches in the lower valleys to more than 50 inches in the highest mountain areas. Snow accumulation and melt is a very significant feature of the annual hydrologic cycle for this watershed. Extreme temperatures in the valley range from –30°F in winter to 110°F in summer. The lower valleys have average frost-free seasons of about 200 days per year from the middle of April to the end of October (Salt Lake County 2004).

Streamflow in the Utah Lake/Jordan River Basin changes because of seasonal variations in precipitation, temperature, evapotranspiration, and human-induced hydrologic modifications from dams and diversions. Hydrologic modifications may control the streamflow, altering the peak runoff periods and natural variability of the streams, which in turn affects the physical, chemical, and biological conditions of the streams and adjacent areas (U.S. Geological Survey 2002). Most of the major unregulated streams and tributaries naturally peak during May to June, with the discharge peak in lower-altitude drainages occurring earlier.

Land use in the watershed is 53% multiple use (logging, mining, grazing, and recreation on BLM, State, and U.S. Forest Service lands), 31% agricultural, and 16% urban, which includes industrial areas around the lake. The greatest impact humans have had on Utah Lake has been the elimination of most of the natural inflow to the lake (Great Salt Lake Basin Hydrologic Observatory 2004).

3.12.2.2 Utah Lake Watershed

The Utah Lake watershed is bound on the east by the Uinta Mountains and Wasatch Plateau, on the west by the Oquirrh and East Tintic Mountains, on the north by the Traverse, Wasatch, and Uinta Mountains, and on the south by the Wasatch Mountains and Wasatch Plateau. The watershed contains portions of three physiographic provinces: the Basin and Range, Middle Rocky Mountains, and Colorado Plateau. Elevations in the watershed range from 4,475 feet at Jordan River Narrows to 11,928 feet at Mt. Nebo in the Wasatch. The Provo, Spanish Fork, and American Fork Rivers and Hobble Creek drain the areas of the physiographic provinces within the watershed and are the primary tributaries to Utah Lake. The Provo River, Spanish Fork River, and groundwater flow contribute most of the water to Utah Lake. Provo River originates in the southwestern margin of the Uinta Mountains and drains portions of Wasatch, Summit, and Utah Counties. Spanish Fork River and its tributaries drain portions of the southern Wasatch Range. Jordan River drains Utah Lake at the lake's northern shore and is the only surface outlet for the lake.

The Provo River is controlled by two major dam sites and reservoirs: Jordanelle and Deer Creek. Water is imported to the Provo River from the Weber Basin by the Weber-Provo Canal and from the Uinta Basin through the Duchesne Tunnel. The Spanish Fork River receives water from the Uinta Basin through the Syar Tunnel. Water from the Syar Tunnel enters Sixth Water Creek, a tributary of Diamond Fork, which flows to the Spanish Fork River.

This basin covers 1,945,100 acres, of which approximately 37% is public lands owned and managed by the federal government, 6% is owned by the state government, 51% is privately owned, and 6% is owned by other parties. The U.S. Forest Service is the major federal land management agency, with jurisdiction over 782,335 acres within the basin. Land uses in the watershed include agriculture, open water and riparian, residential, industrial, and other urban uses. The remaining acreage within the watershed comprises forest and rangelands (Great Salt Lake Basin Hydrologic Observatory 2004).

3.12.2.3 Jordan River Watershed

The Jordan River watershed is bound on the east by the Wasatch Mountains, on the west by the Oquirrh Mountains, and on the south by the Traverse Mountains. The Jordan River flows north and into the Great Salt Lake at the northern extent of the watershed. The Jordan River watershed is unique because it is a closed basin bound by three mountain ranges and the Great Salt Lake. The elevation of the Great Salt Lake is approximately 4,200 feet. The Wasatch Range reaches elevations higher than 11,000 feet. The Oquirrh Mountains to the west reach elevations higher than 9,000 feet.

The Jordan River meanders for approximately 58 river miles, from the outlet of Utah Lake north to the Great Salt Lake. It is fed by a number of perennial (Little Cottonwood Creek, Big Cottonwood Creek, and Mill Creek) and seasonal (Parley's Creek, Emigration Creek, Red Butte Creek, and City Creek) tributary streams, which originate in the Wasatch Mountains to the east. No major streams originate from the western side of the river.

The watershed drains 805 square miles. Approximately 370 square miles are in the rugged Wasatch, Oquirrh, and Traverse ranges. Except for limited portions of Emigration, Big Cottonwood, and Little Cottonwood canyons, the mountainous areas are almost entirely uninhabited.

Most of the lands in the upper watershed are managed by the U.S. Forest Service, which administers 91,933 acres of national forest lands in the Wasatch Range. The state of Utah has scattered land holdings of 9,778 acres. The state also owns the beds of all navigable streams and lakes. Valley floors are composed mostly of private lands. Lands used for industrial purposes are generally scattered throughout the valley, with the most significant cluster in the northwest. Agricultural areas are located in the southern and southwestern portions of the valley, with some irrigated acres in the northwest. Conversion of irrigated agricultural land to residential use, primarily at the southern end of the valley, is the current trend (Salt Lake County 2004).

3.12.2.4 Drainages within Study Area

The project study area traverses six drainages and a portion of Utah Lake (Figure 3.12-1). The drainages (from south to north, in a counterclockwise direction around Utah Lake) include Spring and Beer Creeks; the Spanish Fork River; Dry Creek; Hobble Creek; the Provo and American Fork Rivers, Spring Creek, Dry Creek (in Lehi), and Jordan River. Spring Creek is the outlet of Mill Pond, located near I-15 in American Fork. The project study area also crosses various perennial and seasonal minor tributaries of the above-mentioned waterways. Canals that are located in the project study area include South Field Canal, Mill Race Canal, Matson Canal, Lake Bottom Canal, West Union Canal, Fox Ditch, Bull River Ditch, Murdock Canal, East Jordan Canal, Draper Irrigation Canal, and Jordan and Salt Lake City Canal. Figure 3.12-2 presents the Utah Lake/Jordan River Basin by type of beneficial use and attainment of beneficial use classifications, as defined by UDEQ. Table 3.12-1 shown earlier in this section, along with Table 3.12-2, presents the UDEQ beneficial use classifications and impairment determinations of the surface water bodies in the study area vicinity.

Figure 3.12-1

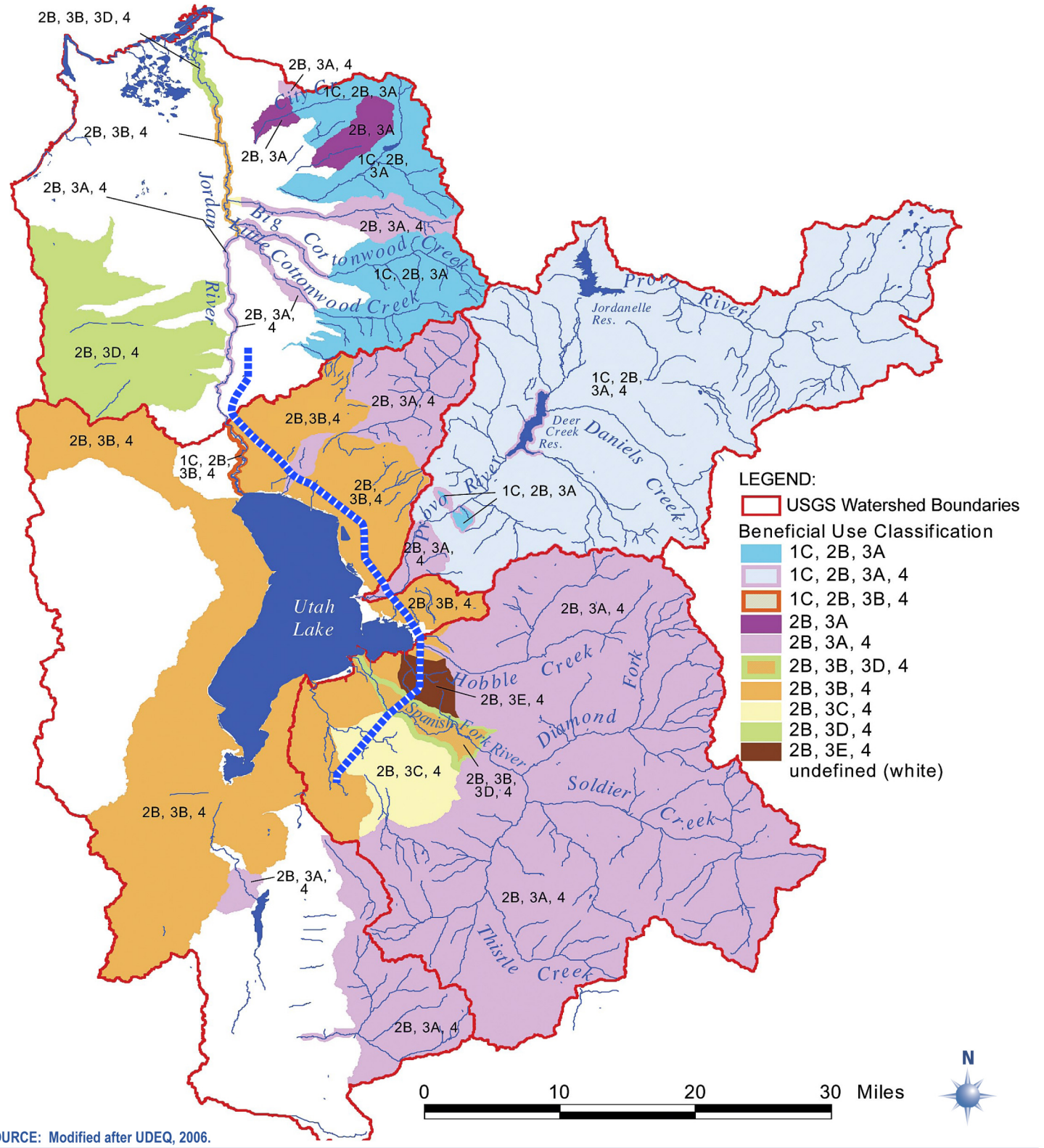
Surface Waters and Canals Near Project Area

LEGEND:

I-15 Corridor

N

0 2.5 5 Miles



SOURCE: Modified after UDEQ, 2006.

Figure 3.12-2

Jordan River and Utah Lake Watershed Unit Beneficial Use Classifications as Designated by UDEQ

LEGEND:
I-15 Corridor

Table 3.12-2: Beneficial Uses of Surface Waters and Impairment Designations

Water Body	Assessment Unit Description[1]	303(d) List of Impaired Waters?	Beneficial Use Class[2]	
			Fully Supported[4]	Partially or Not Supported (Pollutants of Concern)[5]
Utah Lake	Entire Lake	Yes		3B (Total Phosphates, Total Dissolved Solids)
Spring Creek	Spring Creek and Tributaries from confluence with Beer Creek to headwaters	No	3A	
Beer Creek	From 48 West to headwaters	No	2B, 3C, 4	
Spanish Fork River	From Utah Lake to diversion at Moark Junction	No	2B, 3B, 3D, 4	
Dry Creek	From Utah Lake (Provo Bay) to I-15 (including tributaries)	No	2B, 3E, 4	
Hobble Creek	From Utah Lake to headwaters (including tributaries)	No	2B, 3A, 4	
Provo River	From Utah Lake to Murdock diversion	No	2B, 3A, 4	
American Fork River	Below Diversion	No		
Spring Creek	From Utah Lake near Lehi to headwaters (including tributaries)	No	2B, 3A, 4	
Jordan River[3]	From Utah Lake to Narrows	Yes	1C, 2B, 3B	4 (Total Dissolved Solids)
	From Bluffdale to Narrows Diversion	Yes	1C, 2B, 3B	3A (Temperature), 4 (Total Dissolved Solids)
	From 7800 S to Bluffdale	Yes		3A (Temperature), 4 (Total Dissolved Solids)

1 Units chosen were those in the direct vicinity or downstream of the project. Beneficial uses in those areas or reaches that would not be directly or indirectly affected by the proposed project are not reported.
2 See Table 3.12-1 (UDEQ Beneficial Use Classifications) above.
3 Includes several consecutive reaches. Not all beneficial uses supported apply to all reaches on the Jordan River.
4 Source: Utah Department of Environmental Quality, Division of Water Quality 2006a, 2006b
5 Source: Utah Department of Environmental Quality, Division of Water Quality 2006b

As indicated in Table 3.12-2, Utah Lake and multiple segments of the Jordan River were assessed as impaired such that they could not support their aquatic life beneficial use support designation. Utah Lake is impaired for total dissolved solids and total phosphates for warm water species of game fish and other warm water aquatic life (Class 3B water). The Jordan River from Bluffdale to the Narrows and from 7800 South to Bluffdale exceeded the temperature standard for a Class 3A water (cold water game fish) (Utah Department of Environmental Quality, Division of Water Quality 2006a). Farther downstream, segments of the Jordan River exceeded the dissolved oxygen standard. Urban stormwater runoff is considered a significant source of organic loading that creates a large

oxygen demand in the lower parts of the Jordan River. In turn, this causes the oxygen level in the river to fall below State standards downstream of the proposed project (Utah Department of Environmental Quality, Division of Water Quality 2006a).

3.12.2.5 Flooding

Figure 3.12-3 presents the I-15 corridor in relation to FEMA-delineated flood zones. As Figure 3.12-3 illustrates, the current I-15 alignment in the Central and South Utah County Sections crosses portions of the 100-year floodplain associated with Utah Lake and the Spanish Fork River. Segments of the existing alignment in the South Salt Lake County and North Utah County Sections are in the 100-year floodplain. Segments of the existing alignment in the North, Central, and South Utah County Sections are within the 500-year floodplain.

3.12.2.6 Groundwater

Groundwater Hydrology

Groundwater in the Great Salt Lake Basin is contained within unconsolidated basin-fill deposits in the valleys and basins and consolidated rocks in the mountains (Figure 3.12-4). The basin-fill deposits are the principal source of groundwater for domestic and municipal supply and for irrigated agriculture. The deepest and oldest parts of the basin-fill deposits are composed of sediments that were eroded from adjacent mountain ranges and have subsequently become semi-consolidated to consolidated by compaction and cementation. The shallower, younger basin-fill deposits consist of interbedded lacustrine and alluvial sediments that are less compacted and cemented, and generally are more permeable than the underlying, older deposits. The most permeable sediments are remnants of large, prehistoric alluvial fans and deltas, and are composed mainly of gravel and sand deposited near the mountain fronts. These coarser materials form the principal basin-fill aquifers in the Salt Lake and Utah Valleys.

The basin-fill aquifers are classified into two types: shallow aquifers and principal aquifers. The shallow, generally unconfined aquifers consist primarily of coarse-grained basin-fill deposits that are separated from the confined part of the principal aquifers by fine-grained sediments, which form discontinuous confining layers. The shallow aquifers contain the water table, or the first saturated zone in the subsurface, and generally occur in the secondary recharge and discharge areas. The land overlying the shallow groundwater is largely developed and used mainly for agricultural, commercial, industrial, and residential purposes. The shallow aquifers are typically present within the upper 50 feet of basin-fill deposits and therefore are vulnerable to contamination because of the close proximity to human activities at land surface. Low yields and poor quality limit the use of water from shallow aquifers.

The principal aquifer in each basin or valley includes a deep, unconfined aquifer along the mountain front that becomes confined in the valleys where layers of clay, silt, sandy clay, or silt and clay more than 20 feet thick overlie and confine the aquifer. The deep, unconfined portion of the principal aquifer in a basin corresponds to that of a primary recharge area and a lack of substantial confining layers. It may occupy a relatively narrow area if the confining layers are close to the mountain front. The depth to the water table is typically 150 to 500 feet below the land surface. The land above the deeper unconfined aquifers in the study area has generally been undeveloped or is used for residential and commercial purposes. However, as population increases, more land is being developed for residential and commercial use. These aquifers are vulnerable to contamination and are a major source of drinking water to the Utah Valley's population.

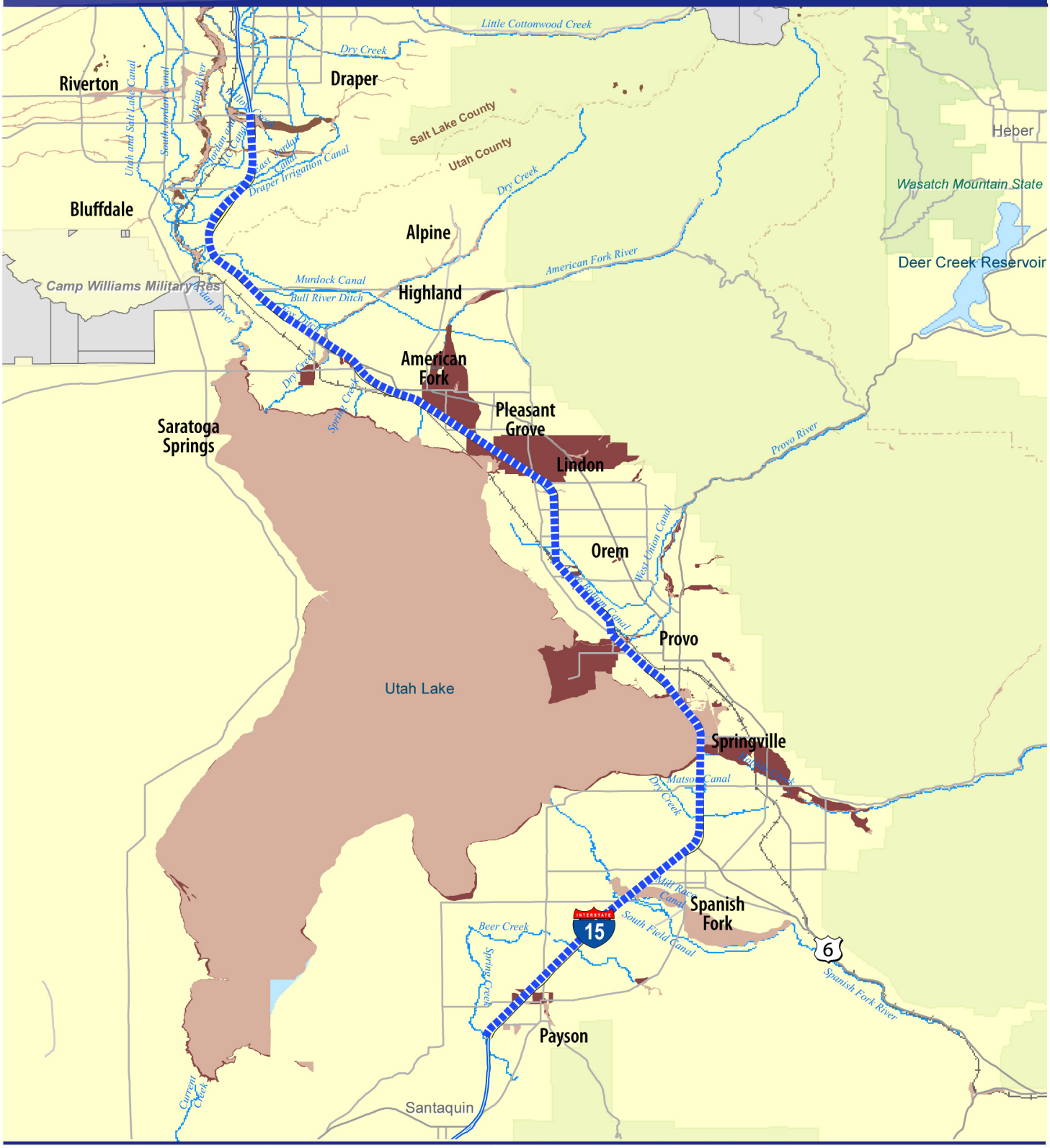


Figure 3.12-3

FEMA-Delineated Floodplains Near Project Area

LEGEND:

I-15 Corridor | 100-yr floodplain | 500-yr floodplain | No floodplain data available

0 2.5 5 Miles

N

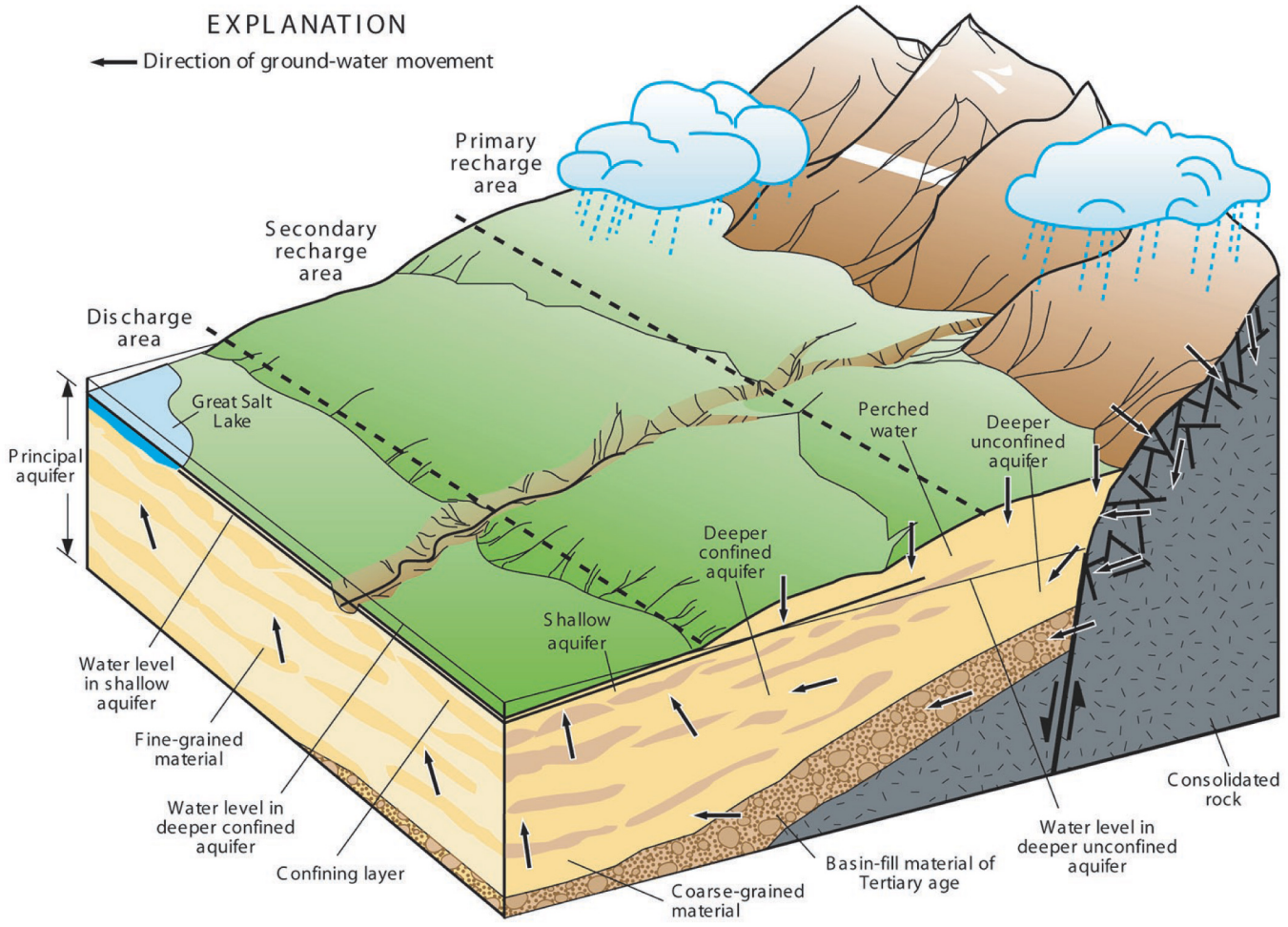


Figure 3.12-4

Groundwater Movement and Recharge in the Great Salt Lake Basin

SOURCE: Baskin et al., 2002.

The deep, confined part of the principal aquifer is recharged by the adjacent deep, unconfined aquifer and by the overlying shallow aquifer, where a downward hydraulic gradient exists and the confining layers are discontinuous. It is susceptible to contamination by flow reversals caused by large amounts of groundwater withdrawal and is also a major source of drinking water. Perched aquifers generally occur above localized lenses of finer-grained deposits overlying the deep, unconfined aquifers. They can be the source of water for springs used for agricultural and livestock purposes but are not typically geographically extensive and are less likely to receive contamination from land surface than the deeper aquifers (confined and unconfined).

Groundwater in the study area generally comes from precipitation in the mountains or on valley benches, where it infiltrates the soil and percolates downward through the basin-fill deposits to the principal aquifers. Groundwater in the principal aquifer in each subarea flows toward the center of the valley and discharges to springs, streams, lakes, and upward to the shallow aquifer. The coarse-grained deposits along the mountain fronts, including large portions of the project study area, are important recharge areas. These recharge areas generally have high hydraulic-conductivity values, and groundwater typically moves rapidly from the land surface into the unconfined part of the principal aquifers. Recharge and discharge areas are shown in Figure 3.12-5. Classifications of recharge and discharge areas were qualitative[1], and no estimates of recharge or discharge were made (U.S. Geological Survey 2002).

Groundwater Quality

Subsurface inflow from the Wasatch Range is the main source of recharge to the deeper aquifer on the east side of the valley, and local precipitation and irrigation water are the main sources of recharge to the shallow system. As a result, the deeper aquifer in this part of the valley is more isolated than the shallow groundwater from activities occurring at the land surface. No large hydraulic gradient exists between the shallow and deeper aquifers in the northwestern part of the valley, and anthropogenic (human-produced) compounds are more prevalent in the shallow groundwater. Pumping from the deeper confined aquifer, however, may cause water and anthropogenic compounds to move downward.

A major groundwater quality issue is the effect of urbanization and groundwater development on water quality. Increased withdrawal of groundwater for public supply and irrigation has induced the movement, both vertical and lateral, of naturally occurring groundwater and anthropogenically affected poorer-quality groundwater. The principal aquifers in the study area include the deeper unconfined and confined parts of the unconsolidated basin-fill aquifers.

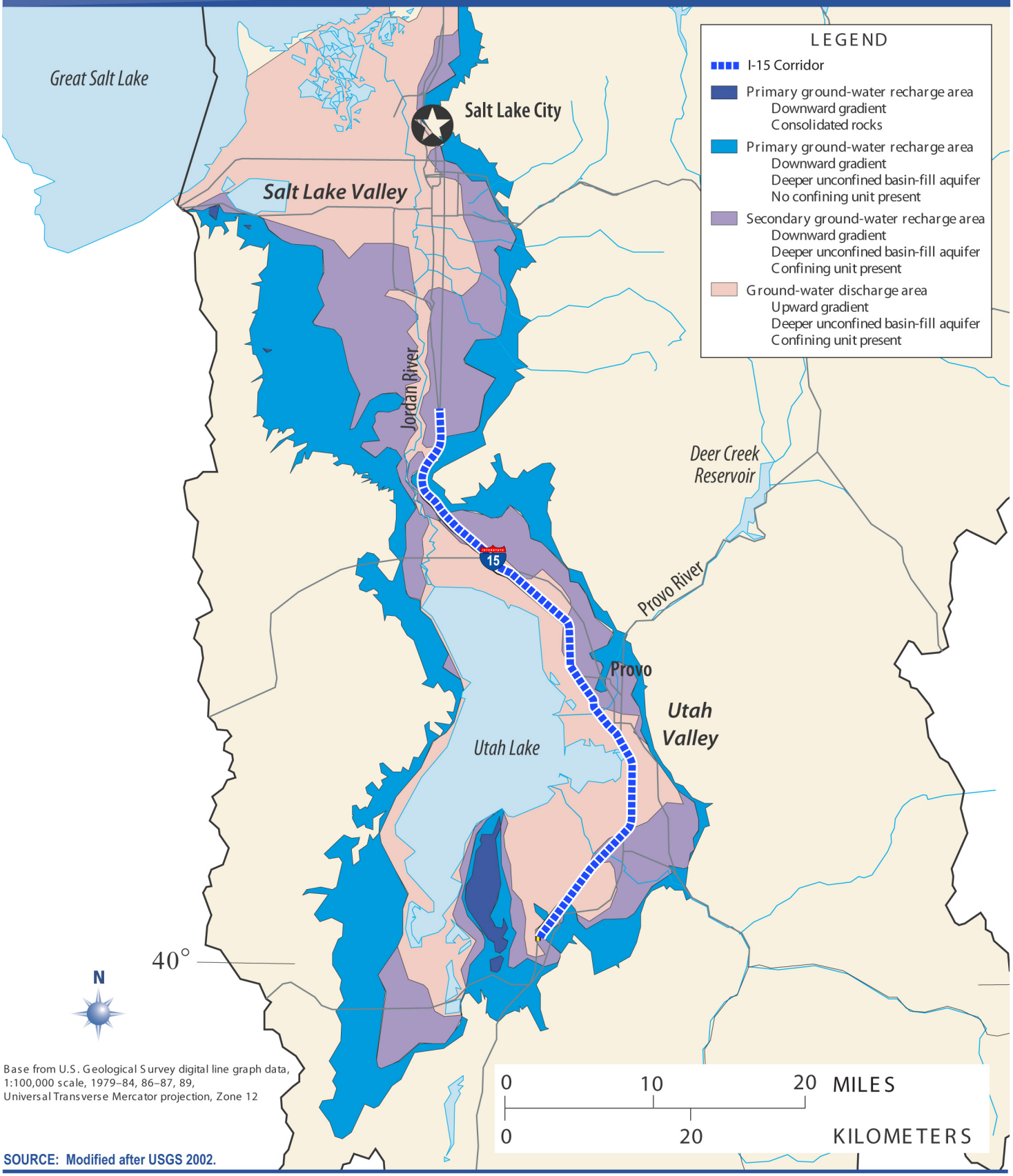
Primary recharge areas have the greatest potential for transmitting contamination to the principal aquifers because of the predominance of coarse-grained sediments and the absence of confining layers within these areas. The coarse-grained sediments in the primary recharge areas typically have large hydraulic conductivity values, and groundwater commonly moves rapidly from the surface down to the principal aquifer. Figure 3.12-5 depicts recharge areas in the project study area.

[1] Areas are classified as primary recharge areas, secondary recharge areas, or discharge areas based on the following definitions:

Primary Recharge Area: Occurs where fine-grained basin-fill deposits that form confining layers between the land surface and the water table are not thicker than about 20 feet. The occurrence of the deeper, unconfined aquifer corresponds with that of primary recharge area.

Secondary Recharge Area: Occurs where a confining layer is present between the land surface and principal aquifer. Where a shallow aquifer is present above the first confining layer, the direction of groundwater movement between the shallow aquifer and confined part of the principal aquifer generally is downward.

Discharge Area: Occurs where the direction of groundwater movement is upward, from the confined part of the principal aquifer to the shallow unconfined aquifer. Discharge areas generally occur in the lowest topographical parts of valleys.



SOURCE: Modified after USGS 2002.

Figure 3.12-5

Groundwater Recharge and Discharge Areas in the Great Salt Lake Basin Study Unit

In secondary recharge areas, the greatest potential for surface contamination to reach the principal aquifer is near the boundary between the secondary and primary recharge areas. Near this boundary, confining layers in the basin fill are generally thinner than they are elsewhere in the secondary recharge areas, and the hydraulic gradient between the shallow aquifer and principal aquifer is higher than that near the boundary between the secondary recharge and discharge areas. In discharge areas, the water moves upward from the principal aquifer; therefore, there is little or no potential for contamination unless pumping from the deeper aquifer is great enough to reverse the vertical gradient or a contaminant is heavier than water (U.S. Geological Survey 2002).

Groundwater Rights

Water rights in Utah are administered by the Utah Department of Natural Resources, Division of Water Rights, and are defined as a right to the use of water based on: 1) quantity, 2) source, 3) priority date, 4) nature of use, 5) point of diversion, and 6) physically putting water to beneficial use (Utah Department of Natural Resources, Division of Water Rights, 2005). Figure 3.12-6 indicates the location of existing groundwater rights in the project study area. Individual groundwater rights may represent one or more actual groundwater wells. Uses of these wells include domestic, irrigation, municipal, stock watering, and other uses, which include uses not previously defined, such as recreational or industrial.

3.12.2.7 De-Icing Operations

The following provides a brief discussion of typical de-icing methods employed by UDOT throughout the state of Utah to prevent ice from building up on roads. This section is presented to provide information on what constituents are likely to occur in the surface and shallow groundwater systems along the I-15 corridor. The discussion is summarized from the FHWA and the USACE's *Final Legacy Parkway Supplemental Environmental Impact Statement/Reevaluation and Section 4(f), 6(f) Evaluation* (2005).

De-icing methods used by UDOT include the application of salt, pre-wetting, and anti-icing. The application of granular salt to a roadway is the most widely used de-icing method. However, UDOT minimizes the use of salt to the extent possible for economic and environmental reasons. Pre-wetting refers to mixing liquid brine (e.g., salt water, typically magnesium chloride) at the spreading disk just before the salt is applied to the road. When the salt is wet, it binds more effectively to the roadway and is less likely to be blown off the road by passing vehicles. Pre-wetting increases the effectiveness of using salt as a de-icing method and reduces the overall quantity of salt required. Anti-icing refers to spreading liquid brine before snow or ice accumulates on the road. This method requires anticipating weather cycles, precipitation, and temperatures.

3.12.3 Alternative 1: No Build

The potential impacts under Alternative 1 would be the same for the South Utah, Central Utah, North Utah, and South Salt Lake County Sections. Floodplain, construction-related water quality, surface water quality, and groundwater quality impacts are discussed below.

3.12.3.1 Floodplain Impacts

The existing I-15 alignment crosses portions of the 100-year floodplain. No additional impacts on floodplains would occur under Alternative 1.

3.12.3.2 Construction-Related Water Quality Impacts

No water quality impacts resulting from construction of the project would occur under existing conditions under Alternative 1. Future transportation improvement projects would be undertaken, as described in Chapter 2 "Alternatives Considered," section 2.4.1. It is likely that these future projects would have construction-related water quality impacts.

Figure 3.12-6

Groundwater Rights in the Project Area

LEGEND:

- I-15 Corridor
- I-15 Alignment Right of Way
- Groundwater Rights Locations within Proposed Project Right of Way

0 2.5 5 Miles

N

Data Source: Utah Department of Natural Resources, Utah Division of Water Rights, 2004

3.12.3.3 Surface Water and Groundwater Quality

Under Alternative 1, the current water quality treatment methods would be maintained, and no additional impacts on surface water quality would occur. Alternative 1 would not result in impacts on groundwater quality; recent conditions and trends in the quality of groundwater would likely continue to occur.

3.12.4 Alternative 4: I-15 Widening and Reconstruction

The impacts of Alternative 4 on floodplains, surface and groundwater quality and water rights are presented for the I-15 corridor project as a whole, inclusive of all four geographic sections.

3.12.4.1 Floodplain Impacts

Proposed improvements under Alternative 4 would remain in FEMA-designated 100-year floodplains associated with Utah Lake, the Spanish Fork River, Hobble Creek, the Provo River, and the Jordan River, where the existing I-15 alignment already encroaches. Installation of Alternative 4 features in these floodplains could potentially result in alteration to floodflows or the extent of the floodplain. In addition, Alternative 4 would increase the area of impermeable surfaces from 730 acres to 1,290 acres, an increase of 77%, and increase the stormwater runoff volume from the project site. These increased flows could potentially alter floodflows if they were not captured before flowing into local surface waters. However, detention basins that would be implemented as part of Alternative 4 would capture additional runoff flows from the project site. The proposed detention basins would be designed to release stormwater flows at a rate of 0.2 cubic feet per second (cfs) per acre from the project site for a 50-year, 24-hour storm based on the TR-55 Graphical Peak Discharge Method[2]. Under Section 3.4 of the "UDOT Manual of Instruction – Roadway Drainage", the NRCS Synthetic Hydrograph, TR-55, is listed as one of the acceptable methods for estimating run-off drainage of drainage structures. TR-55 is a computer model that creates an NRCS Synthetic Hydrograph. The program estimates storage volumes for detention basins by comparing the inflow hydrograph to the outflow hydrograph based on the allowable outflow (0.2 cfs per acre) and the inflow calculated for the drainage area. Releases from the detention basins would be discharged into local surface waters, including ditches, irrigation flumes, Spring Creek, Beer Creek, the Spanish Fork River, Dry Creek, Hobble Creek, the Provo River, Lake Bottom Canal, the American Fork River, and Spring and Dry Creeks.

Implementation of the floodplain conveyance and surface water conveyance mitigation measures described below would mitigate the potential floodplain impacts of Alternative 4. These features would ensure that, during a flood period, evacuation and emergency vehicle routes would be maintained and that the natural floodplain values of the study area would not be diminished. Therefore, implementation of Alternative 4 would meet the requirements of both Executive Orders 11998 and 23 CFR 650, Subpart A.

3.12.4.2 Surface Water Quality

Alternative 4 would increase impermeable surface area and would subsequently increase the volume of runoff from the project site. Increased runoff and impermeable surfaces would increase the potential for the transport of pollutants to local surface waters, especially at stream crossings.

A stream crossing is a location where a road crosses a stream, river, or canal. Stream crossings require structures such as bridges or culverts to allow the water to pass under the road. Depending on the design and construction methods used for the I-15 project, the encroachment of the roadway into a stream and the culverts and bridges at stream crossings could adversely affect a stream's natural flow pattern, profile, channel stability, aquatic habitats, streambank vegetation, or riparian habitats. Encroachment can also increase the stream's velocity and can cause downstream erosion. The closer the roadway is to a stream, the greater the potential for

[2] *Urban Hydrology for Small Watersheds, TR-55*. United States Department of Agriculture, Natural Resources Conservation Service, Conservation Engineering Division, Technical Release 55, June 1986.

water to run off the road without undergoing water quality treatment before it enters the stream. BMP's will also ensure that no untreated run-off from roadways, bridges or other structures will drain into streams or rivers. Types of water quality treatment include detention basins, vegetated swales or bioswales, aeration, or reaction to sunlight. The greater the number of stream crossings, the more quickly the roadway runoff can enter the stream if it is not detained.

The I-15 team completed analyses to assess potential impacts to surface water quality. Impacts to surface waters were evaluated based on the following data and analysis:

- The amount of impervious (paved) area added
- The number of stream crossings
- A numeric analysis of typical roadway runoff pollutants to determine if numeric water quality standards would be exceeded. Impacts to the beneficial uses of water bodies in the impact analysis area were evaluated by Mountain View Corridor (UDOT 2007). The I-15 project assumes similar conditions and the same impaired waters (Jordan River and Utah Lake) as the Mountain View Corridor Project. Therefore, this numeric water quality modeling was not repeated for I-15.
- Potential to affect the impaired 303(d)-listed waters in the I-15 corridor (Jordan River and Utah Lake)
- Potential to affect the surface water's beneficial-use classification.

Under Alternative 4, the amount of impervious area on I-15 would increase from 730 acres to a maximum of 1290 acres. This additional impervious area from roadway pavement can affect water quality in several ways. These include:

- Increased volume of stormwater runoff discharged into streams, which can increase the velocity of the water in the stream. Higher water velocities increase the potential for erosion, and erosion increases the concentration of total dissolved solids (TDS) and total suspended solids (TSS) in the stream.
- Increased paved area which requires more de-icing chemicals, which can increase TDS levels.
- Increased automobile traffic, which can increase several automobile-related pollutants, primarily copper, lead, and zinc.
- Reduced infiltration of stormwater into the soil. Infiltration treats and improves water quality because microbes in the soil help filter pollutants and because particulates settle out of the stormwater into the soil.

To evaluate impacts from the I-15 alternatives, typical contaminants from highway runoff were considered. These contaminants are listed in Table 3.12-3. Four highway runoff contaminants were evaluated using different methods of numeric analysis. Concentrations of copper, lead, and zinc were modeled using the Federal Highway Administration's (FHWA) numeric water quality model (see Section 1.4, FHWA Numeric Analysis). Concentrations of TDS were assessed by modeling the concentrations of de-icing chemicals and by using event mean concentration (EMC) values from the Stormwater Quality Data Technical Report prepared for Salt Lake County (Salt Lake County 2000).

Table 3.12-3: Typical Highway Runoff Contaminants

Contaminant	Sources
Bromide	Exhaust
Cadmium	Tire wear, herbicide application
Chloride	De-icing salts
Chromium	Metal plating, engine parts, brake lining wear
Copper	Metal plating, bearing wear, engine parts, brake lining wear, fungicide and insecticide use
Cyanide	Anti-cake compound used to keep de-icing salts granular
Iron	Auto body rust, steel highway structures, engine parts
Lead	Tire wear, lubricating oil and grease, bearing wear, atmospheric deposition
Manganese	Engine parts
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, brake lining, asphalt paving
Nitrogen, phosphorous	Atmosphere, sediments
Particulates (sediments or TSS)	Pavement wear, vehicles, atmosphere, maintenance, snow/ice abrasives, sediment disturbance
Pathogen Bacteria Waste	Soil, litter, bird droppings, trucks hauling livestock/stockyard
Polychlorinated biphneyls (PCBs)	Spraying of highway rights-of-way, atmospheric deposition, catalyst in synthetic tires
Petroleum	Spills, leaks, blow-by motor lubricants, antifreeze, hydraulic fluids, asphalt surface leachate
Rubber	Tire wear
Sodium, calcium	De-icing salts, grease
Sulfate	Roadway beds, fuel, de-icing salts
Total dissolved solids (TDS)	De-icing salts, vehicle deposits, pavement wear
Zinc	Tire wear, motor oil, grease

Source: FHWA 1996

FHWA's numeric water quality model quantifies the impacts of metals in the highway runoff on surrounding water quality. The model is explained in two FHWA research documents: FHWA-RD-88-006, *Pollutant Loadings and Impacts from Highway Stormwater Runoff* (FHWA 1990), and FHWA-RD-96-095, *Retention, Detention, and Overland Flow for Pollutant Removal from Highway Stormwater Runoff* (FHWA 1996).

The available data indicate that the heavy metals considered in this analysis (copper, lead, and zinc) are the dominant toxic pollutants contributed by highway stormwater runoff. The procedure used for this analysis is a probabilistic dilution model developed and applied in EPA's Nationwide Urban Runoff Program and reviewed and approved by EPA's Science Advisory Board. The model allows the user to determine how often a certain concentration of a pollutant will occur in a stream given the variable and intermittent discharges of water that are produced by stormwater runoff. The model computes the highest in-stream concentration of the pollutant that is expected to occur over a 3-year period after the runoff is mixed with and diluted by the water in the stream (FHWA 1990, 1–2.)

Flow rates for the modeled streams were determined from U.S. Geological Survey gage data. The analysis assumes that the concentrations of each pollutant of concern in the stormwater runoff are similar to the EMCs as analyzed from samples collected during storm events for various locations in Salt Lake County from 1992 to June 2000. These samples were taken as part of the Utah Pollutant Discharge Elimination System permit requirements for Salt Lake County, the Utah Department of Transportation (UDOT) Region 2, and Salt Lake City. The roadway sampled for the report is Interstate 215 (I-215) between the Jordan River and a location about 1,700 feet east of Fashion Boulevard (about 300 East) (Salt Lake County 2000). These EMCs were used since they were more site-specific than the average values suggested by the numeric analysis documentation (FHWA 1996). The values used in the analysis are shown in Table 3.12-4.

Table 3.12-4: Event Mean Concentrations during Sampled Storm Events

Pollutant	EMC (mg/L)
Total copper	0.039
Total lead	0.031
Total zinc	0.181
TSS	116
TDS (sampled in April, May, June, Sept. and Oct.)	581

EMSs are an average over 5 years from 1995 to 2000
Mg/L = milligrams per liter
Source: Salt Lake County 2000

Runoff from the I-15 action alternatives would undergo water treatment primarily through detention basins. The pollutant removal rates of detention basins in the FHWA document (FHWA 1996) were replaced with the more conservative removal rates recommended in UDOT's literature (UDOT 2003) (see Table 3.12-5).

Table 3.12-5: Percentages of Pollutants Removed by Detention Ponds

Pollutant	Percent Removed
Copper	44%[a]
Lead	69%[b]
Zinc	59%[b]

[a] Source: FHWA 1996, 72
[b] Source: UDOT 2003, 30 (A removal percentage for copper was not provided in this document.)

UDOT applies salt on its roads to reduce ice and improve traction during heavy snowfall. UDOT applies slightly more salt along the Wasatch Front than in the rest of the state. Along the Wasatch Front, UDOT uses two different methods to apply salt for a winter storm (Chaney 2008). These methods are based on forecasting and now-casting

(forecasting at the moment when the storm begins) by the UDOT Meteorological Center and meteorological consultants as well as through local observations from UDOT maintenance personnel and meteorologists. Based on these predictions, salting trucks are mobilized and salt is applied as follows:

- Brine is applied once per storm at a rate of 15 gallons per lane-mile with a salt concentration of 23%.
- Each application of salt consists of 250 lbs per lane-mile.
- Salt will be spread at the beginning of a snow storm and again for every 3 inches of additional snowfall.

Not all of the salt applied to the road reaches surface water. Some of the salt is precipitated onto the road surface, and some is dissolved in the runoff from melted snow and ice. Much of the granular salt is re-deposited along the road shoulders, and some of the dissolved salts from these deposits infiltrate into the roadside soils with the runoff. Some salt could run off into adjacent streams as the snow melts. Dissolved solids are typically measured in the form of total dissolved solids (TDS).

Table 3.12-6 shows the calculation for TDS concentrations in snowmelt due to UDOT's anti-icing operations assuming that 100% of the salt applied is immediately dissolved and runs off the right-of-way.

Table 3.12-6: Approximate TDS in Snowmelt Runoff Due to Anti-icing Operations

Inputs or Standards	Description	Assumptions or Results
Storm event	Total snowfall depth	6 inches
Anti-icing	Number of brine applications	1
	Number of road salt and brine applications	2
Roadway Data	Total inside paved shoulder width	24 feet
	Total number of traffic lanes and auxiliary lanes	12 lanes
	Total outside paved shoulder width	24 feet
	Total tributary vegetated width within right-of-way	0 feet
Salt applied	Salt quantity due to brine	5.53 ft^3/mile
	Salt quantity due to spreader	45.00 ft^3/mile
	Total salt applied	50.53 ft^3/mile
Run-off	Run-off from snowmelt	45,619 ft^3/mile
Results	Approximate TDS in snowmelt runoff due to TDS anti-icing operations	1,108 ppm

Shaded cells are required input variables.
ft3/mi = cubic feet per mile
ppm = parts per million
mg/L = milligrams per liter

Assumptions used in the calculation are:

- Water content of snow is 10%.
- Brine is applied once per storm at a rate of 15 gallons per lane-mile with a salt concentration of 23 %.Each application of salt consists of 250 pounds per lane-mile.
- Salt is spread at the beginning of a snowstorm and again for every 3 inches of additional snowfall.
- All salt applied is dissolved in snowmelt runoff from pavement and tributary vegetated areas within the right-of-way.
- Brine and salt are applied to traffic lanes and auxiliary lanes only.
- Runoff coefficient for pavement = 0.9.
- Runoff coefficient for vegetated right-of-way = 0.25.
- Specific gravity (unit weight of salt) = 2.165 (135 pounds per cubic foot); dry bulk density of rock salt for de-icing = 80 pounds per cubic foot.
- One cubic foot of rock salt is approximately 60% salt by volume.

These assumptions are based on numbers from UDOT Environmental (Chaney 2008) specifically for the Wasatch Front.

The typical concentrations of TDS in highway runoff as sampled for highway projects are 581 mg/L (milligrams per liter). The location of this sampling was an outlet to the Jordan River at I-215 (Salt Lake County 2000). As shown above in Table 3.12-6, approximate TDS in Snowmelt Runoff Due to Anti-icing Operations, the estimated TDS concentration was 1,108 ppm, which assumes that 100% of the salt is dissolved and runs off the roadway. Both the modeled and observed concentrations of TDS taken from the Jordan River at I-215 are less than the Utah in-stream agricultural TDS standards of 1,200 mg/L for crop irrigation and 2,000 mg/L for stock watering. The existing concentrations of TDS in the streams that were modeled are below the standards for their beneficial uses. Because UDOT expects to use similar de-icing methods on the I-15 as the methods it uses on I-215, periodic increases in TDS levels in the receiving waters in the impact analysis area could be anticipated in the winter and early spring. The TDS standard applies to agricultural uses only. The majority of agricultural uses of water occur in the middle to late spring, summer, or fall. De-icing is typically not done during these periods. Consequently, any increases in TDS levels from de-icing would not occur when the majority of water for agriculture would be required. Most importantly, I-15 would not change the beneficial uses of streams in the impact analysis area as a result of an increase in TDS levels.

Surface Water Quality Impacts

For the FEIS, analyses added the TDS spreadsheet, and consideration of the FHWA numeric analysis, as described above. Both analyses show that the project will not further impair either the Jordan River or Utah Lake, which are the only two 303(d)-listed impaired waters in the study area. The analyses also show that the project will not alter the Beneficial Use Classification of any waters in the study area.

As a result of the Utah Lake and Jordan River impairment status, additional stormwater quality treatment measures and implementation of best management practices (BMPs) would be necessary to mitigate potential project impacts on the water quality of local surface waters.

3.12.4.3 Groundwater Quality

Alternative 4 has potential to generate certain constituents, as described in the surface water impact discussion above, through the use and maintenance of the highway and the increase in impervious surfaces. These pollutants could potentially seep into groundwater and affect existing groundwater quality, particularly salt concentrations. Effects on confined aquifer groundwater quality could affect local water supplies. Most of the Alternative 4 alignment overlies groundwater discharge and secondary recharge areas (Figure 3.12-5). Minimal portions of the alignment overlie primary groundwater recharge areas. Both the groundwater discharge and secondary groundwater recharge areas have confining units that restrict the vertical transport of groundwater from shallow, unconfined aquifers to deeper, confined aquifers. In addition, groundwater would have an upgradient in the groundwater discharge areas. The confining layer and upgradient flow of groundwater would restrict the infiltration of surface runoff into the principal

confined aquifers and would minimize the potential effects on groundwater quality. However, Alternative 4 would be likely to contribute to adverse, though insignificant, effects on the existing water quality of the shallow aquifer in the study area. Implementation of mitigation measures to protect the surface water quality, such as minimizing salt application, is described below and would also mitigate the potential groundwater quality impacts of Alternative 4.

3.12.4.4 Groundwater Rights

Groundwater rights and their associated wells occur in the Alternative 4 limits of disturbance, as indicated in Figure 3.12-6. Wells located in the limits of disturbance would be affected by implementation of Alternative 4 because the owners of the wells would not be able to maintain ownership. The approximate number of wells affected by Alternative 4 is shown in Table 3.12-7. Implementation of the mitigation measure for groundwater rights compensation would reduce the impact on groundwater-rights owners in the limits of disturbance.

Table 3.12-7: Affected Groundwater Rights within the Limits of Disturbance[a]

Classification of Water Rights	South Utah County Section	Central Utah County Section	North Utah County Section	South Salt Lake County Section
Domestic	12	44	28	5
Irrigation	10	55	59	8
Stock Watering	25	40	37	13
Municipal	0	0	17	0
Other[b]	1	2	4	0
Total[c]	48	141	145	26

[a] *Affected groundwater rights* represents groundwater rights located within the limits of disturbance.
[b] *Other* constitutes a range of uses not classified above, such as recreational or industrial.
[c] The totals shown in the table are different than the actual number of water rights in the limits of disturbance because some water rights have more than one classification and some have no classification.
Source: Utah Division of Natural Resources, Department of Water Rights, 2004

As described above, Alternative 4 would disturb soils during construction activities and increase the area of impervious surfaces compared to existing conditions. These activities could increase the potential transport of pollutants from the project site to groundwater wells outside the limits of disturbance. Pollutants in the runoff could potentially affect the groundwater quality in or near the wells and potentially affect the ability of the well owners to utilize their water rights. However, as described under the construction-related water quality and surface water quality impact discussions, all surface water runoff during construction activities would be captured and treated within the limits of disturbance.

3.12.4.5 Comparison of Design Options

Options A, B, C, and D in the Provo/Orem area would have the same impacts on floodplains. The design of the structures that would cross the Provo River floodplain would be the same, regardless of option. All would maintain the floodplain values and not increase encroachment into the floodplain over Alternative 1 No Build. The American Fork Main Street Options A, B and C do not cross or impact any floodplain.

The Preferred Alternative includes Option D in Provo/Orem and Option C in American Fork. Further details about the refinements made to the Preferred Alternative are located in Chapter 2.

The additional impermeable surface area for Provo/Orem Options A, B, C, and D and for American Fork Options A, B, and C are shown in Table 3.12-8.

Table 3.12-8: Comparison of Additional Impermeable Surface Area (in acres) by Design Option

Central Utah County Provo/Orem Options				Northern Utah County American Fork Main Street		
A	B	C	D	A	B	C
266	247	234	220	63	66	66

3.12.4.6 Indirect Impacts

No indirect impacts are expected.

3.12.5 Mitigation

UDOT will be required to obtain a State of Utah Stream Alteration Permit (General Permit 40) and an individual Section 404 Permit from the USACE and to prepare specific design standards that ensure that the proposed project features (i.e., bridge abutments, footings, and other features in the floodplain) do not reduce the capacity of the channels upstream or downstream of the structures or increase channel erosion. During final design of the Preferred Alternative, UDOT will undertake hydraulic modeling. These analyses will consider the final engineering of highway structures and drainage facilities across the floodplains, and indicate appropriate drainage mitigation to be implemented by UDOT, such as floodplain equalization culverts. UDOT will comply with local floodplain ordinances and permits.

Surface water conveyance structures will be designed and constructed to allow for the free movement of water to minimize increases in channel gradients, and to minimize concentrated discharges to waterways in the proposed project area. Types of surface water conveyances that could be implemented may include culverts, a series of small culverts, French drains, corrugated strip drains, synthetic drainage nets, and gravel layers.

A stream alteration permit from the Utah Department of Natural Resources, Division of Water Rights, will be required and obtained for the river and stream crossings that will result in a major stream alteration or modification. Stream alteration permits are generally combined with the USACE's Section 404 permit application to facilitate a streamlined permitting process.

UDOT will contact the operators of canals and other irrigation facilities before construction activities begin and will coordinate with the owners of these facilities to avoid or minimize impacts.

A storm water pollution prevention plan (SWPPP) will be prepared by UDOT or its contractors to comply with the required Utah Pollutant Discharge Elimination System (UPDES) permit. It will include measures to minimize potential for erosion or scour within the limits of disturbance and in local affected waterways. The SWPPP will focus on erosion-sensitive areas, sediment-sensitive areas, and control and precautionary measures to be followed. Other elements of the SWPPP will include a maintenance schedule of BMPs, drainage and culvert systems, pre- and post-construction hydrology, non-stormwater discharges, waste disposal, dust control, re-vegetation, and monitoring procedures. Applicable BMPs that will be implemented on the project site as part of SWPPP implementation will be selected from the developed standard UDOT construction BMPs and may include, but are not limited to, the following measures:

- Water pollution prevention control measures will be scheduled and implemented to correspond with ground-disturbing activities.
- Erosion control measures, such as erosion control blankets, fiber wattles, and berms, will be installed within 100 yards of all natural waterways.
- In-stream construction or diversion activities will be performed in the low-flow season.

- Only clean, granular material, rock, or aggregate will be used for the construction of temporary dikes or cofferdams, and permanent riprap.
- Waste disposal will occur according to federal, state, and county health and pollution control regulations.
- Repair or refueling of construction equipment will be performed at least 100 feet from surface waters.
- Turbidity levels in surface waters will meet EPA and UDEQ requirements through the implementation of measures including, but not limited to, brush or rock filters, silt fences, sediment traps, check dams, filter strips, sand bag barriers, or flotation silt curtains.
- Turbidity levels will be monitored frequently during in-stream construction activities. If an applicable federal or state turbidity requirement is exceeded, all construction activities will cease until the turbidity levels are less than the applicable standard.
- Activities with a high potential for causing sediment transport will not be performed during high runoff flows.
- Re-vegetation of areas disturbed by the Preferred Alternative will occur immediately after the completion of construction activities.

Selected BMPs will be used to prevent runoff from leaving the limits of disturbance. BMPs will ensure that no untreated run-off from roadways, bridges, or other structures will drain into streams or rivers. Final selection of BMPs will consider input from UDEQ and the USACE.

In the event of any accidental spills of hazardous materials during construction, UDOT will be required to take immediate appropriate action. In accordance with UDOT Specification 01355, the contractor will notify the engineer and UDEQ of spills of petroleum-based products or hazardous waste if the release meets the definition of a hazardous waste as defined in 40 CFR 261.

Measures to treat the water quality of stormwater runoff from the limits of disturbance will be implemented to remove oils, grease, sediments, and heavy metals. BMPs to treat water quality will be selected from UDOT's developed standard measures and may include vegetated filter strips, oil and water separators, outlet protection, and erosion control blankets. These measures will be implemented along the entire Preferred Alternative alignment. Final selection of BMPs will consider input from UDEQ and the USACE and will comply with the existing UDOT individual stormwater permit. The exact types of stormwater treatment system that will ultimately be installed as part of this project will not be determined until final roadway design. The design-build contractor will be responsible for determining final selection of water quality treatments. Long-term maintenance of these water quality treatment features will be performed by UDOT.

For impacted wells located in the limits of disturbance, UDOT will either purchase the groundwater rights from the owner or pay for a transfer of the rights.

3.13 Vegetation and Invasive Species

This section describes the vegetation communities that occur in the project study area and addresses the potential impacts on vegetation that may result from implementing Alternative 1 and Alternative 4. The vegetation impacts correlate to direct loss of wildlife habitat. Additional detailed discussion of vegetation as it relates to wildlife habitat is provided in Section 3.15, *Wildlife, Threatened and Endangered Species, and Special-Status Plants*, of this chapter.

This section also lists noxious weeds of concern in Utah and Salt Lake counties and noxious weeds observed in the study area. Potential noxious weed impacts resulting from the implementation of Alternative 4 and mitigation measures are also identified.

3.13.1 Regulatory Setting

On February 3, 1999, President Bill Clinton signed Executive Order 13112, which requires federal agencies to combat the introduction or spread of invasive species in the United States. The order defines invasive species as "any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem whose introduction does or is likely to cause economic or environmental harm or harm to human health."

The Utah Noxious Weed Act (Title 4, Chapter 17-1, of the Utah Code and Constitution) requires each county to formulate and implement a countywide noxious weed control program that is designed to prevent and control noxious weeds within the county.

3.13.2 Affected Environment

3.13.2.1 Physical Setting

The project study area is located primarily along the east side of Utah Lake, in the Utah Valley, at the western base of the Wasatch Mountains. The Wasatch Mountains mark the eastern limit of the Great Basin Province, which is characterized by a cold high-desert climate. The regional study area includes the Utah Valley and the full length of the Jordan River in the Great Salt Lake Basin. The climate has been characterized as cool winter steppe or semi-arid (Jackson and Stevens 1981). Precipitation varies around the lake and can be attributed to the local differences in temperature and local topography, with averages ranging from 9 inches at Vineyard to 18 inches at Santaquin (Jackson and Stevens 1981).

3.13.2.2 Methodology

Site visits were conducted in August 2004 to determine the specific types of vegetative assemblages occurring within the study area and to ascertain information on the distribution and general controlling factors of these communities. The specific types of vegetative assemblages then were studied to determine the general species composition and to verify interpretation of aerial photographs of the areas and geographic information system (GIS) maps of land cover types, based on U.S. Geological Survey (USGS) National Land Cover and National Wetland Inventory datasets.

The existing vegetation within the project study area exhibits extensive disturbance because of previous construction of railroad corridors, I-15, and many smaller roads, as well as other previous development and disturbance (e.g., urban and suburban development, farming, livestock grazing, dikes, and fences). General vegetation assemblages of potential occurrence within the study area include riparian, emergent marsh, wet meadow, pasture, cropland, salt desert scrub, and developed (including urban landscaping). The following paragraphs provide general descriptions of the vegetative types occurring within the project study area.

3.13.2.3 Riparian

Riparian habitat is uncommon, degraded, and fragmented within the project study area. This habitat is restricted to a few river courses and an area ("Camelot Forest") between the North Springville interchange and Provo Bay. The Jordan River and Camelot Forest support the majority of this habitat type in the project study area. Remnant native vegetation includes Fremont cottonwood (*Populus fremontii*), sandbar willow (*Salix exigua*), and narrowleaf cottonwood (*Populus angustifolia*). In many areas, however, these species have been replaced by Russian olive (*Elaeagnus angustifolius*), Siberian elm (*Ulmus pumila*), and saltcedar (*Tamarix ramosissima*).

Impacts to riparian vegetation were calculated from scaled aerial photographs where rivers, streams or canals cross within the study area outlined in Volume II. Riparian acreages are exclusive of all types of delineated wetlands and Waters of the U.S. The project will impact a maximum of 4.4 acres of riparian vegetation, and a minimum of 3.2 acres. Impacts by design option are detailed below.

3.13.2.4 Emergent Marsh

Emergent marshes are wetlands dominated by herbaceous vegetation adapted to seasonally or semipermanently flooded conditions. Water depth varies but is not deep enough to restrict the growth of emergent plants. Vegetation commonly observed in these marshes includes hard stem bulrush (*Scirpus acutus*), alkali bulrush (*Scirpus maritimus*), three square bulrush (*Scirpus americanus*, *Scirpus pungens*), cattail (*Typha latifolia*), creeping spikerush (*Eleocharis palustris*), reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), blister buttercup (*Ranunculus scleratus*), water buttercup (*Ranunculus aquatilis*), and Nebraska sedge (*Carex nebrascensis*).

Within the project study area, emergent marshes are found adjacent to the open water habitats along the eastern boundary of Provo Bay, near Mill Pond in American Fork, and in a few ponds along I-15. Refer to Section 3.14, *Wetlands/Waters of the United States*, for more detailed discussion of wetland vegetation. Agriculture and urbanization along the western edge of the Wasatch Mountains have greatly influenced the number and types of emergent marsh habitats in the area. Agricultural runoff has increased the frequency and duration of inundation and soil saturation in many locations. Emergent marshes also have been created by impoundment of both groundwater and surface water by roads and dikes.

3.13.2.5 Wet Meadow

Wet meadow habitats are the most abundant type of wetland in the project study area. They are typically found in areas with a high water table or groundwater discharge, where poorly drained soils cause seasonally saturated and sometimes flooded conditions. Surface water flows can contribute to or prolong seasonally wet conditions. Inundation occurs less frequently and for shorter duration in wet meadows than in emergent marshes. Refer to Section 3.14, *Wetlands/Waters of the United States*, for additional discussion of wetland vegetation. Agriculture and urbanization have modified the hydrologic regime of wet meadows in the project study area much as they have affected emergent marshes. Plant species commonly observed in wet meadows within the project study area include Baltic rush (*Juncus balticus*), clustered field sedge (*Carex praegracilis*), Nebraska sedge, rabbits-foot grass (*Polypogon monspeliensis*), foxtail barley (*Hordeum jubatum*), little barley (*Hordeum pusillum*), curly dock (*Rumex crispus*), and saltgrass (*Distlichlis spicata*).

3.13.2.6 Pasture

Much of the farmland in the project study area consists of pasture. It is the most abundant habitat type found in the project study area. Before conversion for agricultural purposes, pastures were typically wet meadows or salt desert scrub habitats. Pastures are generally located on flat or gently sloping lands and are vegetated with a mix of perennial nonnative grasses. Typical forage species planted in pastures include meadow brome (*Bromus riparius*), smooth brome (*B. inermis*), tall fescue (*Festuca arundinacea*), meadow fescue (*F. pratensis*), perennial ryegrass (*Lolium perenne*), creeping meadow foxtail (*Alopecurus arundinaceus*), intermediate wheatgrass (*Elymus hispidus*), tall wheatgrass (*E. elongatus*), and timothy (*Phleum pratense*). The height of the vegetation varies according to season, level of irrigation, drainage, fertilization, landscape applications, and livestock stocking levels; it ranges from as little as 3 inches to 24 inches or more on fertile soils prior to grazing applications.

3.13.2.7 Cropland

Large tracts of cropland are located within the project study area. The major crops actively farmed on these lands include corn, wheat, sod, and alfalfa. Much of the cropland is regularly disturbed as a result of active crop rotation.

3.13.2.8 Salt Desert Scrub

Desert scrub occurs primarily in the saline upland areas of the study area. It is characterized by shadscale (*Atriplex confertifolia*), Gardner saltbush (*Atriplex gardneri*), and greasewood (*Sarcobatus vermiculatus*). Within the project study area, this habitat has been heavily grazed by free-range livestock. Native grasses have been largely replaced by exotic grasses and forbs, including abundant cheatgrass (*Bromus tectorum*). Japanese brome (*Bromus japonicus*), wheatgrass (*Elymus* spp.), bulbous bluegrass (*Poa bulbosa*), whitetop (*Caldaria draba*), storksbill (*Erodium cicutarium*), and gumweed (*Grindelia squarrosa*) are also abundant throughout the project study area.

3.13.2.9 Developed / Urban Landscaping

Developed/urban landscaping comprises areas that are used for residential, commercial, or industrial purposes. Pavement and buildings, with occasional urban landscaping, such as lawns, shrubs, and trees, predominantly cover these portions of the project study area.

3.13.2.10 Invasive Species

The Utah Noxious Weed Act requires each county to formulate and implement a countywide noxious weed control program designed to prevent and control noxious weeds. In administering the Utah Noxious Weed Act, the state weed specialist coordinates and monitors weed control programs throughout the state. County commissioners may declare a particular weed a county noxious weed. A list of noxious weeds of concern in Utah is provided in Table 3.13-1.

To identify noxious weeds that may be of concern in the project vicinity, the following sources were used:

- State Noxious Weeds: Utah Noxious Weed List (Utah Department of Agriculture and Food 2007), which lists officially designated noxious weeds for the State of Utah, per the authority vested in the Commissioner of Agriculture under the Utah Noxious Weed Act.
- County Declared Invasive Weeds: County Noxious Weeds 2003 (Utah Department of Agriculture and Food 2003), available at http://ag.utah.gov/plantind/nox_county.pdf. No county-declared invasive weeds are identified on the County Noxious Weed List for Utah and Salt Lake counties.

Aquatic nuisance species pose a substantial threat to Utah water resources. Because their habitat occurs in the study area, the two species of primary concern are purple loosestrife (*Lythrum salicaria*), which often grows on the banks of perennial streams and in wet meadow habitat, and Eurasian watermilfoil (*Myriophyllum spicatum*), which requires perennial open water. In addition, the zebra mussel (*Dreissena polymorpha)*, an aquatic bivalve, also has the potential to occur in the study area.

Table 3.13-1: Noxious Weeds of Potential Concern in Utah

Common Name	Scientific Name
Quackgrass	*Agropyron repens*
Hoary cress	*Cardaria draba*
Musk thistle	*Carduus nutans*
Diffuse knapweed	*Centaurea diffusa*
Spotted knapweed	*Centaurea maculosa*
Russian knapweed	*Centaurea repens*
Yellow starthistle	*Centaurea solstitialis*

Table 3.13-1: Noxious Weeds of Potential Concern in Utah - continued

Common Name	Scientific Name
Squarrose knapweed	*Centaurea squarrosa*
Canada thistle	*Cirsium arvense*
Field bindweed (wild morning glory)	*Convolvulus arvensis*
Bermuda grass	*Cynodon dactylon*
Leafy spurge	*Euphorbia esula*
Dyers woad	*Isatis tinctoria*
Perennial pepperweed	*Lepidium latifolium*
Purple loosestrife	*Lythrum salicaria*
Scotch thistle	*Onopordum acanthium*
Johnsongrass	*Sorghum halepense*
Perennial sorghum	*Sorghum halepense* and *Sorghum almum*
Medusahead	*Taeniatherum caput-medusae*

Source: Utah Department of Agriculture and Food 2007.

The noxious weed species observed in the study area during the wetland delineation included quackgrass, hoary cress, musk thistle, yellow starthistle, Canada thistle, field bindweed, perennial pepperweed, purple loosestrife, and scotch thistle.

3.13.3 Alternative 1: No Build

No construction-related impacts on vegetation from I-15 would occur under Alternative 1.
Under Alternative 1, regular road maintenance would occur, and invasive weed species occurring within the study area likely would be managed as part of the UDOT weed control program. Therefore, Alternative 1 is not expected to result in the spread of noxious weeds.

3.13.4 Alternative 4: I-15 Widening and Reconstruction

Alternative 4 would involve vegetation clearing, grading, and other soil-disturbing activities. All existing vegetation would be permanently removed from the project limits of disturbance and the ground surface directly converted for highway transportation purposes. Vegetation assemblages occurring in the project limits of disturbance, including riparian, emergent marsh, wet meadow, pasture, cropland, salt desert scrub, and developed/urban landscaping, would experience impacts from the proposed construction activities. The existing vegetation in the project study area is highly disturbed from various past and ongoing human activities (e.g., agriculture, fences, roads, and urban development). Therefore, the additional effects that Alternative 4 would have on vegetation are expected to be minimal. Implementing this alternative would not be likely to result in any detectable change in the population viability of any individual plant species or vegetation community in the area.

Cumulative impacts on biological resources are generally additive and proportional to the amount of ground disturbance within specific habitat types. Detailed discussions of direct impacts on wildlife habitat and wetlands are included in subsequent Sections 3.14, *Wetlands/Waters of the United States*, and 3.15, *Wildlife, Threatened and*

Endangered Species, and Special-Status Plants, respectively. Indirect and cumulative impacts are addressed in Section 3.19, *Indirect and Cumulative Impacts*.

The unpaved portions of the reconstructed I-15 right-of-way would be re-vegetated in conformance with a landscaping plan that would be developed in accordance with UDOT's specifications. UDOT is responsible for managing Utah state designated invasive species in their right-of-way.

Construction activities associated with Alternative 4 could introduce or spread noxious weeds into areas not currently infested. Plants or seeds of noxious weeds may be dispersed via construction equipment and may be able to colonize disturbed soil if appropriate mitigation measures are not implemented. Impacts from the introduction of invasive species include displacement or elimination of native plant species and therefore degradation of habitat for wildlife species, which depend on native plants for food. Displacement of native plants could in turn indirectly affect community structure and ecosystem processes. The potential for introducing and spreading invasive species is anticipated to be the same for all of the Alternative 4 design options. However, implementation of mitigation measures identified in Section 3.13.5 would ensure that construction activities would not introduce or spread invasive species in the study area.

3.13.4.1 Comparison of Design Options

The area of land acquired for Alternative 4, as summarized in Table 3.4-1 "Summary of Alternative 4 Relocation Impacts" was used to compare the relative vegetation impacts of the four design options in the Provo/Orem area and for the three American Fork Main Street options. This additional land and its associated vegetation would be disturbed during construction and incorporated into the Alternative 4 right-of-way.

The project will impact a maximum of 4.4 acres of riparian vegetation, and a minimum of 3.2 acres. The common areas will impact no more than 0.8 acres of riparian vegetation. In the Provo-Orem area, Option A will impact 3.4 acres, Option B will impact 3.2 acres, Option C will impact 2.4 acres and Option D will impact 2.4 acres. The differences are explained by the presence or absence of frontage roads or an Orem 800 South Interchange. In American Fork, all three design options impact 0.2 acres of riparian vegetation. The Preferred Alternative includes Option D in Provo/Orem and Option C in American Fork. The Preferred Alternative will impact 3.3 acres of riparian vegetation.

3.13.5 Mitigation

The re-vegetation of the I-15 right-of-way will mitigate for the loss of urban landscaping vegetation from I-15 widening and reconstruction in conformance with a landscaping plan. UDOT will specify that certified weed-free seed mixes used for landscaping and/or erosion control. Wetland re-vegetation will be included under the Clean Water Act (CWA) Section 404 permitting process.

Removal of riparian vegetation will be minimized, where possible. Vegetation along river corridors that are impacted by equipment or other construction activities will be replaced with native riparian vegetation.

During design/construction, UDOT will develop an Invasive Weed Control specification which identifies best management practices (BMPs) that will be used to control the introduction and spread of noxious weeds on disturbed sites along the right-of-way.

In compliance with Executive Order 13112, the Utah Noxious Weed Act, and subsequent guidance from the Federal Highway Administration (FHWA), the landscaping and erosion control included as part of the project will not use species listed as noxious weeds. In areas of particular sensitivity, extra precautions will be taken if invasive species are found in or adjacent to the construction areas. These include the inspection and cleaning of construction equipment and eradication strategies to be implemented should an invasion occur.

A number of measures to avoid or minimize construction impacts on vegetation will be implemented during and after construction. Certain measures relate only to construction activities near environmentally sensitive areas such as

wetland/riparian areas and floodplains, while others relate to upland site stabilization and re-vegetation, or final project design considerations. The measures related to construction include the following:

- Construction specifications will require contractors to prevent any unnecessary destruction, scarring, or defacing of vegetation in the work vicinity. Trees, shrubs, and other vegetation will be preserved and protected from construction activities and equipment, except where clearing and grubbing is required for fill, excavation, or other construction activities (e.g., retaining wall).
- Clearing and grubbing activities will be limited to that needed for project construction. All critical environmental areas including wetlands, riparian areas, stream corridors, and floodplains will be clearly delineated and marked with hazard fencing before the start of construction and avoided to the maximum practicable extent. Critical environmental areas will not be used for equipment, material storage, construction staging grounds and maintenance activities, or field offices.
- Excavated or graded materials will not be stockpiled or deposited near or on any waterways or wetlands outside the approved footprint.
- As soon as an area is no longer needed for construction, stockpiling, or access, final site stabilization and landscape restoration measures will be initiated. Any lands disturbed and not permanently occupied by project facilities will be graded to provide proper drainage, covered with topsoil stripped from construction areas or stockpiles, scarified as needed, and re-vegetated with a low-lying, grass-forb seed mix that will be less likely to attract wildlife into the highway right-of-way.
- Mulching or other comparable methods will be used as a means of controlling dust and erosion, and to aid re-vegetation efforts.
- When no longer required by the contractor, any temporary access roads will be graded to ensure proper drainage and erosion prevention, and made impassable to traffic. Temporary access road surfaces will be scarified to establish conditions suitable for reseeding or replanting and will be blocked from traffic to allow establishment of vegetation.
- To ensure successful plant establishment, permanent plantings will occur during the early spring and/or fall when precipitation is sufficient for plant survival. All plantings will be monitored by UDOT and the landscape contractor.
- During monitoring, any noxious weeds will be identified and controlled by UDOT and the contractor. If noxious weeds are identified during monitoring, preventative measures will be used to ensure that the landscape restoration program succeeds.
- A weed control management plan will be developed by the contractor and approved by UDOT prior to initiating construction. Measures to avoid the establishment and spread of noxious weeds will include at a minimum: (1) inspection and cleaning of all construction equipment, (2) use of weed-free seed mulches, topsoil and seed mixtures during landscaping and (3) use of eradication strategies in the event a noxious weed invasion occurs.

3.14 Wetlands / Waters of the United States

This section describes the wetlands and other aquatic resources that occur within the wetland delineation study area. Sources of information used for this assessment include National Wetland Inventory (NWI) maps, aerial photographs, field surveys, wetland delineations, and technical literature. The section presents the following information:

- methods used to characterize and quantify wetlands and other water features in the wetland delineation study area;
- a description of the wetlands and other water features occurring in the wetland delineation study area;
- a general discussion of wetland functions;
- a discussion of direct and indirect impacts on wetlands located in the wetland delineation study area; and
- a discussion of measures to avoid, minimize and mitigate wetland impacts.

3.14.1 Regulatory Setting

3.14.1.1 Federal Regulations

Clean Water Act Section 404

The U.S. Army Corps of Engineers (USACE) developed a definition of waters of the United States under the 1972 Clean Water Act (33 U.S.C. 1251). *Waters of the U.S.* are defined as waters currently or previously used for interstate or foreign commerce; all interstate waters; any waters, the destruction of which could affect interstate or foreign commerce; all impoundments; tributaries of the previously mentioned waters; the territorial seas; and wetlands adjacent to waters.

Wetlands are defined as a subset of waters of the U.S. and, for the purposes of regulatory guidance, are considered special aquatic sites.

USACE has jurisdiction over waters of the U.S. USACE further defines wetland in the Section 404 of the Clean Water Act as:

> … those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

USACE presently has jurisdiction over any waters that are adjacent to navigable waterways. For this EIS, it is assumed that all waters within the ecosystem impact analysis area are jurisdictional and subject to the authority of USACE.

Under Section 404 of the Clean Water Act, no discharge of dredged or fill material is permitted in waters of the U.S. if there is a less environmentally damaging practicable alternative to that part of the activity that would result in a discharge of fill material to waters of the U.S. An alternative is practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.

For actions that are subject to NEPA, where USACE is the permitting agency and, in this case, a cooperating agency, the NEPA alternatives analysis must provide the information necessary for a Clean Water Act Section 404(b)(1) alternatives analysis and selection of the least environmentally damaging practicable alternative.

Clean Water Act Section 401

CWA Section 401 gives EPA review authority over issuance of Section 404 permits. EPA reviews whether an activity might result in a discharge that violates federal or state water quality standards and provides a water quality certification if these standards would be met. Section 401 allows states to assume authority for water quality review; in Utah, EPA has delegated this authority to the Utah Department of Environmental Quality (UDEQ), Division of Water Quality.

Executive Order 11990: Protection of Wetlands

Executive Order 11990 (May 24, 1977) directs all federal agencies to refrain from assisting in or giving financial support to projects that encroach on public or privately owned wetlands. It further requires federal agencies to support a policy to minimize the destruction, loss, or degradation of wetlands. A project that encroaches on wetlands may not be undertaken unless the agency has determined that 1) there are no practicable alternatives to such construction; 2) the proposed action includes all practicable measures to minimize harm to wetlands that would be affected by the project; and 3) the impact would be minor.

3.14.1.2 State Regulations

Utah Division of Water Rights Stream Alteration Rules (Title R655-13)

Any project that proposes to alter a natural stream within Utah must first obtain a stream alteration permit from the Utah State Engineer's office. The purpose of regulating activities that affect the bed or banks of natural streams is to ensure that a project does not impair vested water rights and does not unreasonably or unnecessarily affect any recreational use or the natural stream environment, endanger aquatic wildlife, or diminish the natural channel's ability to conduct high flows. Under these rules, a natural stream is defined as any waterway, along with its fluvial system, that receives sufficient water to sustain an ecosystem that distinguishes it from the surrounding upland environment.

3.14.2 Affected Environment

3.14.2.1 Methodology for Assessment of Existing Conditions

Wetland Delineation

A wetland delineation of the I-15 Corridor was conducted between August 2005 and August 2007 (Wetland Resources 2006 and 2007). The wetland delineation study area includes the median and both sides of I-15, varying from 125 feet from the edge of pavement to more than 600 feet from edge of pavement in some areas. At existing and proposed interchanges, the wetland delineation study area was extended to include enough additional area to evaluate realignment of the interchanges.

The wetland delineation was completed in accordance with the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and for Addendum 2 the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (U.S. Army Corps of Engineers 2006). All potential wetland areas were checked for wetland indicators. If wetland indicators were present, a sample point was completed for that area. For each sample point, plant species within a 6-foot radius of the sample point were recorded and the percent of relative cover for each species was determined by estimating areal cover. The wetland indicator status of each species was determined from the *National List of Plant Species That Occur in Wetlands: Intermountain - Region 8* (U.S. Fish and Wildlife Service 1988). Sample points were also examined for soil characteristics and indicators of wetland hydrology.

The recent Rapanos guidance was not utilized for this EIS because the original delineation was completed prior to issuance of this guidance.

On November 2, 2007, the USACE issued a letter on the project's jurisdictional delineation, with minor adjustments. The delineation of wetlands analysis in this section reflects the USACE concurrence letter including the adjustments. That determination is valid for 5 years from the date of the letter.

3.14.2.2 Existing Conditions

Physical Setting

The wetland delineation study area is located primarily along the east side of Utah Lake, in the Utah Valley, at the western base of the Wasatch Mountains. The Wasatch Mountains mark the eastern limit of the Great Basin Province, which is characterized by a cold high-desert climate. The climate has also been described as cool winter steppe or semi-arid (Jackson and Stevens 1981). Precipitation varies around the lake and can be attributed to the local differences in temperature and topography, with averages ranging from 9 inches per year at Vineyard to 18 inches per year at Santaquin (Jackson and Stevens 1981).

Utah Lake is a large, freshwater lake covering more than 94,000 acres (Jackson and Stevens 1981; Fuhriman et al. 1981). Despite its size, the lake is quite shallow, ranging from 6–10 feet deep. The headwaters of the source streams are in the Wasatch and Uinta Mountains to the east. The lake hydrology is supported by four major streams, several minor perennial streams, and many intermittent streams. All four of the major streams that drain into the lake (American Fork River, Hobble Creek, Provo River, and Spanish Fork River) cross the study area. The area surrounding the lake is underlain by low-pressure artesian aquifers; numerous springs are also present in and near the lake (Fuhriman et al. 1981). The Jordan River is Utah Lake's sole surface outlet.

Existing Wetland Resources in the Wetland Delineation Study Area

The wetland delineation study area, described above in section 3.14.2.1, encompasses approximately 247 acres of wetlands (Table 3.14-1). This acreage includes wetlands that were delineated but are not directly impacted by the project. Volume II of this DEIS shows the wetlands that were delineated for this project.

Table 3.14-1: Summary of Wetland Acreage in the Interstate 15 Wetland Delineation Study Area

Waters of the United States	Wet Meadow	Marsh	Shrub	Forested	Total
26	78	132	2	9	247

Source: Wetland Delineation Report for I-15 Highway Corridor South Santaquin to 12300 South.

Wetland Cover Types

Wetlands in the wetland delineation study area consist of a series of biological communities, or cover types, that are characterized by the structure and composition of the vegetation and by the water regime. Brotherson (1981) described the main aquatic and semi-aquatic communities associated with Utah Lake. This section provides information on the wetland cover types in the wetland delineation study area, based on Brotherson's descriptions and on observations made during the field reconnaissance. The general locations of wetland cover types in the South Utah County, Central Utah County, North Utah County, and South Salt Lake County Sections are shown in Figures 3.14-1 to 3.14-4, respectively.

Wet Meadow

Wet meadow is a wetland plant community that is characterized by grasses and other low-growing, perennial monocots. Although the soil may be saturated for long durations, the vegetation is generally not emergent. Three types of wet meadow—spikerush-sedge meadow, grass-rush-sedge meadow, and annual herbaceous wetlands—occur in the wetland delineation study area.

The first type of wet meadow occurring in the wetland delineation study area is spikerush-sedge meadow. The dominant species are creeping spikerush (*Eleocharis palustris*), Nebraska sedge (*Carex nebrascensis*), and arctic rush (*Juncus arcticus)*. The drier portions of the community are dominated by salt grass (*Distichlis spicata*). Under the U.S. Fish and Wildlife Service (USFWS) classification system (Cowardin et al. 1979), this community is classified as "Palustrine, Emergent, Seasonally Flooded." The wetland hydrology of spikerush-sedge meadow is supported both by lake water and groundwater. Early in the growing season, the level of the water table may be higher than the ground surface, causing inundation. However, the length of inundation is shorter in meadow than in marsh habitats. The meadow areas are inundated in winter and spring but are drained by late summer, although the soils may remain saturated at the surface for extended periods.

The second type of wet meadow occurring in the wetland delineation study area is grass-rush-sedge meadow. The dominant species include salt grass, arctic rush, creeping spikerush, Nebraska sedge, clustered field sedge (*Carex praegracilis*), and foxtail barley (*Hordeum jubatum*). Under the USFWS classification system, this community is classified as "Palustrine, Emergent, Saturated, or Temporarily Flooded." Grass-rush-sedge meadow is supported primarily by groundwater. However, this community is also found in irrigated pastures. Inundation, when it occurs, is short lived. However, the soils remain saturated for long periods during the growing season. As the water table drops in summer, the meadows become drier, and upland species may begin to grow by late summer.

Also classified within wet meadow were annual herbaceous wetlands, miscellaneous small wetlands dominated by annual, ruderal (disturbance-tolerant), generally non-native species. Typical species in these annual herbaceous wetlands include willow-weed *(Polygonum lapathifolium*), oakleaf goosefoot (*Chenopodium glaucum*), common cocklebur (*Xanthium strumarium*), witchgrass (*Panicum capillare*), sea-purslane (*Sessuvium verrucosum*), annual rabbit's-foot grass (*Polypogon monspeliensis*), and curly dock (*Rumex crispus*). Species more typical of wet meadow habitats may also be present but not abundant. This wetland type includes recently excavated areas that support wetland hydrology and natural wetlands that have been substantially disturbed. This wetland type is scattered throughout the wetland delineation study area. Under the USFWS classification system, this community is classified as "Palustrine, Unconsolidated Shore, Seasonally Flooded." The wetland hydrology of annual herbaceous wetlands in the wetland delineation study area is provided by surface water, primarily as runoff from precipitation or snowmelt.

Marsh

Marsh is a wetland plant community that is characterized by tall, emergent, perennial, herbaceous monocots. The characteristic plant species of marsh within the wetland delineation study area are broadleaved cattail (*Typha latifolia*) and hard stem bulrush (*Scirpus acutus*), although common reed (*Phragmites australis*), creeping spikerush, and reed canary grass (*Phalaris arundinacea*) are also common. Much of Provo Bay is bordered by bulrush-cattail marsh, and smaller stands are present throughout the wetland delineation study area. Under the USFWS classification system, this community is classified as "Palustrine, Emergent, Semipermanently Flooded."

In marsh, water covers the ground surface for long periods during the growing season. The sources of wetland hydrology include surface water in marsh adjacent to Utah Lake and Mill Pond or along streams and canals, as well as groundwater away from the lake. Water depth can range from a few inches to several feet, but usually it is not deep enough to restrict the growth of emergent plant species.

Areas where marsh is supported primarily by groundwater are typically located in springs or depressions where the ground surface drops below the level of the water table. During spring, when the water table is high because of snowmelt and precipitation, these depressions are inundated. As the level of the water table drops in summer, the marsh areas may no longer be inundated, although the soils remain saturated.

Lowland Woody Communities

Two types of lowland woody wetland communities occur in the wetland delineation study area. The scrub-shrub community is characterized by an overstory of woody shrubs and small trees that are typically less than 9 feet tall. In the wetland delineation study area, the overstory of scrub-shrub wetlands is typically dominated by coyote willow (*Salix exigua*), but there are also areas that support tamarisk (*Tamarix ramosissima*). Understory plant species are similar to those found in wet meadow, including saltgrass, arctic rush, reed canary grass, and foxtail barley. This community occurs along streams or in association with wet meadow. Under the USFWS classification system, this community is classified as "Palustrine, Scrub-Shrub, Seasonally Flooded."

The forested wetland cover type is characterized by an overstory of large trees. In the wetland delineation study area, the dominant canopy species is Russian olive (*Elaeagnus angustifolia*). Stands of forested wetland occur primarily along streams and canals. Under the USFWS classification system, this community is classified as "Palustrine, Forested, Seasonally Flooded."

Lowland woody wetland communities are typically supported by shallow groundwater tables, usually in the vicinity of streams and other water bodies. In the wetland delineation study area, scrub-shrub wetlands associated with meadows also appear to be supported by springs. Inundation, when it occurs, is seasonal and usually short lived, usually in association with floods or seasonal stream flow peaks. Riparian forest and scrub, also associated with streams and water bodies, are similar to woody wetland communities, but the water table is much lower, wetland hydrology and soils absent, and the herbaceous understory is dominated by upland plant species.

Figure 3-14.1

General Location of Wetland Cover Types - South Utah County Section

LEGEND: **Wetland Cover Types**

- Wet Meadow
- Marsh
- Scrub-Shrub
- Forested
- I-15 Corridor

Note: This figure is a graphic representation of the general location of wetlands and is not to scale.

N

Data Sources: Wetland Delineation Report I-15 Highway Corridor-South Santaquin to 12300 South, 2006; USGS National Land Cover Dataset.

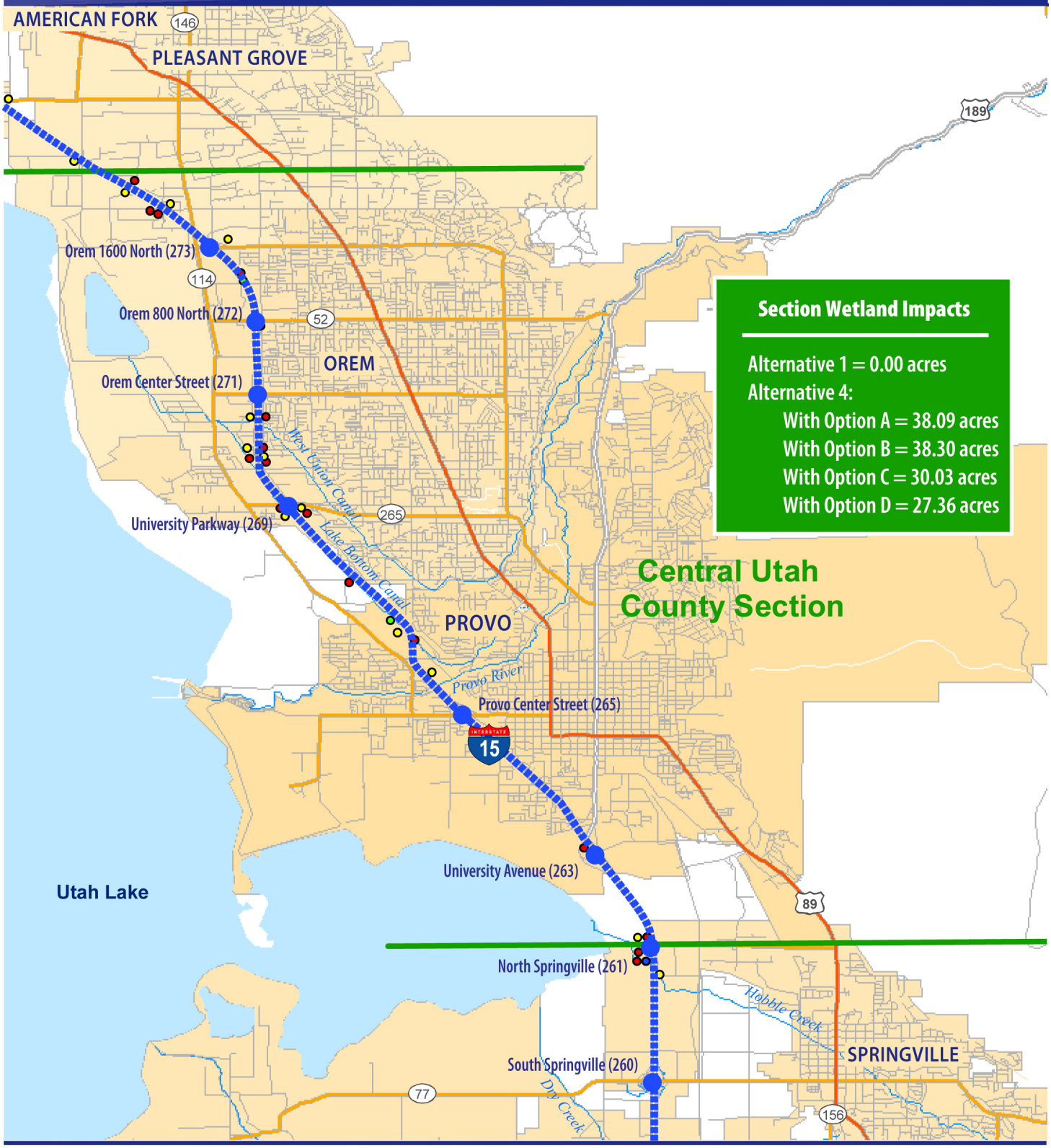


Figure 3-14.2

General Location of Wetland Cover Types - Central Utah County Section

LEGEND: **Wetland Cover Types**

- Wet Meadow
- Marsh
- Scrub-Shrub
- Forested
- I-15 Corridor

Note: This figure is a graphic representation of the general location of wetlands and is not to scale.

N

Data Sources: Wetland Delineation Report I-15 Highway Corridor-South Santaquin to 12300 South, 2006; USGS National Land Cover Dataset.

Figure 3-14.3

General Location of Wetland Cover Types - North Utah County Section

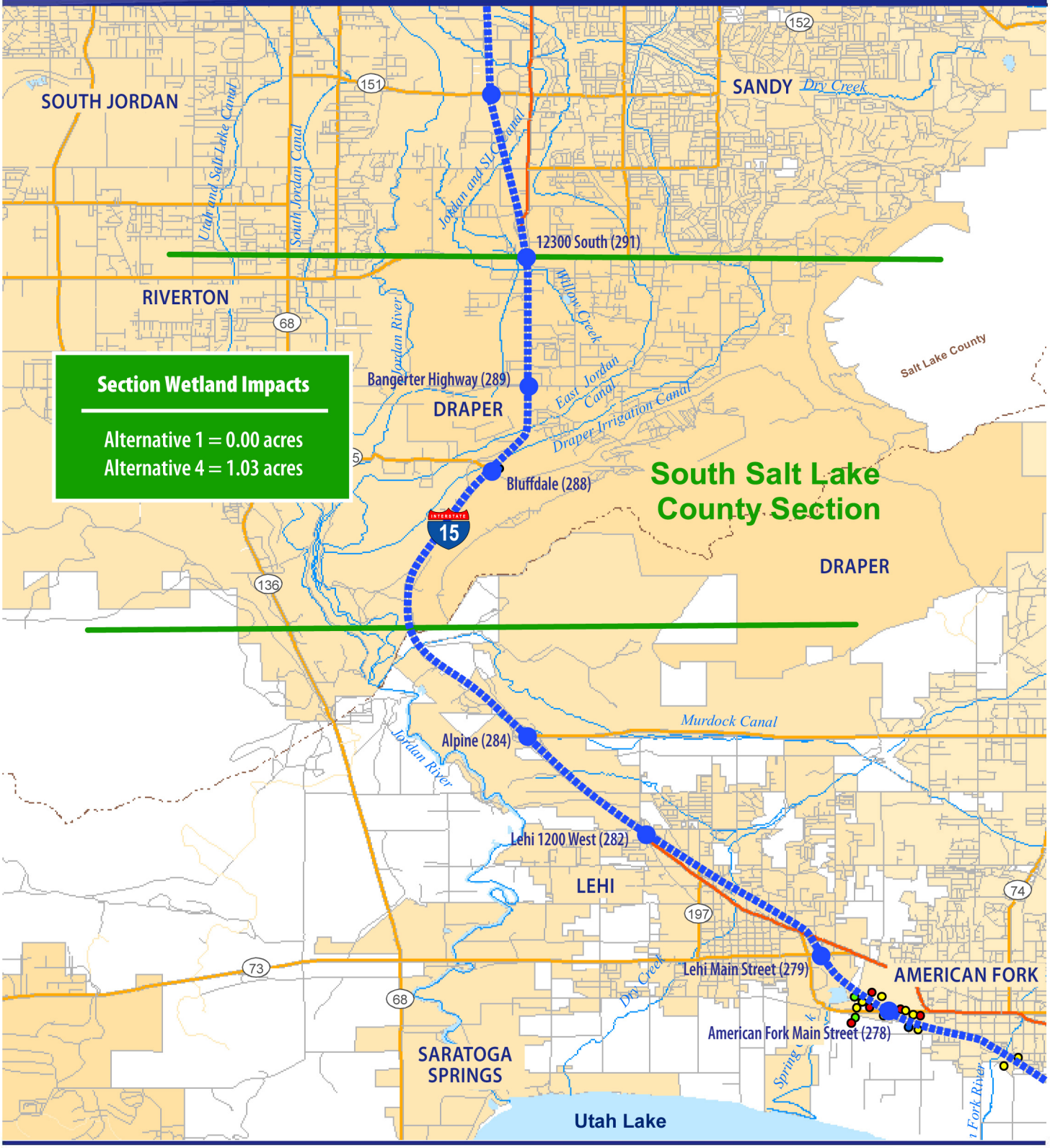
LEGEND: **Wetland Cover Types**

- Wet Meadow
- Marsh
- Scrub-Shrub
- Forested
- I-15 Corridor

Note: This figure is a graphic representation of the general location of wetlands and is not to scale.

N

Data Sources: Wetland Delineation Report I-15 Highway Corridor-South Santaquin to 12300 South, 2006; USGS National Land Cover Dataset.



Section Wetland Impacts

Alternative 1 = 0.00 acres
Alternative 4 = 1.03 acres

Figure 3-14.4

General Location of Wetland Cover Types - South Salt Lake County Section

LEGEND: **Wetland Cover Types**

- Wet Meadow
- Marsh
- Scrub-Shrub
- Forested
- I-15 Corridor

Note: This figure is a graphic representation of the general location of wetlands and is not to scale.

N

Data Sources: Wetland Delineation Report I-15 Highway Corridor-South Santaquin to 12300 South, 2006; USGS National Land Cover Dataset.

Other Waters of the United States

Other waters of the United States include certain lakes, rivers, streams and their tributaries. Other waters identified within the wetland delineation study area, include the Spanish Fork River, Hobble Creek, the Provo River, and the American Fork River.

Wetland Functions

Category I wetlands are of exceptionally high quality, or are important from a regulatory standpoint. They can represent a high quality example of a rare wetland type, provide irreplaceable ecological functions, exhibit exceptionally high flood attenuation capability, be rated exceptionally high for Plant Community Composition, or are assigned high ratings for most of the assessed functions.

Category II wetlands are those that provide habitat for sensitive plants or animals, function at very high levels for wildlife/fish/amphibian habitat, or are assigned high ratings for many of the assessed functions.

Category III wetlands generally have moderate to low Plant Community Composition rating, and have a higher level of disturbance than Category I and II wetlands. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands.

Category IV wetlands are generally small, isolated, and are typically rated low for Plant Community Composition. These wetlands provide little in the way of wildlife habitat.

3.14.3 Alternative 1: No Build

Under Alternative 1, there would be no project-related impacts on wetland resources.

3.14.4 Alternative 4: I-15 Widening and Reconstruction

The following sections describe wetland impacts for Alternative 4, including each of the frontage road options, and interchange options. Two categories of wetland impacts would occur: direct and indirect. Direct impacts to wetlands from Alternative 4 range from 46.95 acres for the Preferred Alternative to 60.43 acres, depending upon options selected in the Provo/Orem area and at the American Fork Main Street interchange. These impacts are slightly higher than the acreages presented in the DEIS. Since the DEIS, further design has added two detention basins, one in the South Utah County Section and one in the Central Utah County Section. Both basins are located in the common areas and have no impact on the options in Provo/Orem or American Fork.

Direct impacts are impacts that would occur as a result of ground disturbance required to construct Alternative 4. The determination of these impacts on delineated wetlands was based on the environmental limit line developed from the conceptual engineering for the alternative (shown in Volume II of this EIS). This environmental limit line was established based on the conceptual engineering conducted for the alternatives and the options within Alternative 4 this engineering is shown in the drawings contained in Volume II of this EIS.) It was generally established as a 50-foot offset from the shoulder of the Alternative 4 I-15 mainline, a 25-foot offset from the shoulder of ramps, and a 15-foot off-set from the shoulder of cross streets and from the frontage roads in Options A and B. These offsets take into account grade differences and resulting slopes. The environmental limit line also incorporates the area required to accommodate temporary construction activity.

The location of the delineated wetlands was incorporated into the conceptual engineering and the impacts on those wetlands calculated. This analysis assumed that all delineated wetlands within this environmental limit line would be filled, with subsequent loss of all wetland functions.

3.14.4.1 South Utah County

In the South Utah County section, the proposed project would result in the placement of fill materials in portions of 13 wetlands totaling 9.14 acres of direct impacts (Table 3.14-2). Additionally, there are direct impacts to 1.02 acres of non-wetland waters of the United States. An existing UDOT wetland mitigation site would also be impacted at the North Springville Interchange.

Table 3.14-2: Direct Impacts of Highway Construction on Wetlands (Acres) –

South Utah County Section

Type of Impact	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
Direct Effects	3.81	5.22	0.11	0.00	9.14

3.14.4.2 Central Utah County

In the Central Utah County section, portions of 19 wetlands would be filled, impacting between 27.36 acres and 38.30 acres of wetlands, depending on option. The difference in wetland impacts by option are illustrated in the following table. Two existing UDOT wetland mitigation sites would be impacted, one at the Orem University Parkway interchange (Options A and B only) and one at the Orem 1600 North interchange.

Table 3.14-3: Direct Impacts of Interchange Construction on Wetlands (Acres) –

Central Utah County Section Options

Option	Type of Impact	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
With Option A	Direct Effects	17.88	14.41	0.00	5.80	38.09
With Option B	Direct Effects	17.93	14.57	0.00	5.80	38.30
With Option C	Direct Effects	13.02	12.84	0.00	4.17	30.03
With Option D (Preferred)	Direct Effects	11.17	12.02	0.00	4.17	27.36

Options A and C would fill 0.06 acres of non-wetland waters of the United States. Options B and D would fill 0.04 acres of non-wetland waters of the United States.

3.14.4.3 North Utah County

In the North Utah County section, the proposed project would result in fill materials being placed in portions of 18 wetlands, impacting between 9.42 acres and 11.96 acres of wetlands, depending on option, as shown in Table 3.14-4. In addition, 0.16 acre of non-wetland waters of the United States would be filled.

Table 3.14-4: Direct Impacts of Interchange Construction on Wetlands (Acres) –

North Utah County Section Options

American Fork Main Street Option	Type of Impact	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
With Option A Diamond	Direct Effects	4.62	4.03	0.06	0.74	9.45
With Option B South SPUI	Direct Effects	7.38	2.94	0.16	1.48	11.96
With Option C North SPUI (Preferred)	Direct Effects	5.18	3.77	0.05	0.58	9.42

3.14.4.4 South Salt Lake County

Table 3.14-5 summarizes the direct impacts on wetlands for South Salt Lake County. A total of 1.03 acres of one wetland would be filled.

Table 3.14-5: Direct Impacts of Highway Construction on Wetlands (Acres) –

South Salt Lake County

Type of Impact	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
Direct Effects	0.00	0.00	1.03	0.00	1.03

3.14.4.5 Impact Summary for Alternative 4

A summary of the direct impacts to wetlands and other waters of the United States that could result from implementing Alternative 4 is provided in Table 3.14-6.

Table 3.14-6: Wetland Impact Summary for Alternative 4 (Acres)

Section / Option	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
Section Totals					
South Utah County	3.81	5.22	0.11	0.00	9.14
Central Utah County					
With Option A	17.88	14.41	0.00	5.80	38.09
With Option B	17.93	14.57	0.00	5.80	38.30
With Option C	13.02	12.84	0.00	4.17	30.03
With Option D (Preferred)	11.17	12.02	0.00	4.17	27.36
North Utah County					
With Option A Diamond	4.62	4.03	0.06	0.74	9.45
With Option B South SPUI	7.38	2.94	0.16	1.48	11.96

Table 3.14-6: Wetland Impact Summary for Alternative 4 (Acres) - Continued

Section / Option	Wet Meadow	Marsh	Shrub-Scrub	Forested	Total
With Option C North SPUI (Preferred)	5.11	3.68	0.05	0.58	9.42
South Salt Lake County	0.00	0.00	1.03	0.00	1.03
Total (Minimum)	Preferred Alternative				46.95
Total (Maximum)	Alternative 4 with American Fork Option B and Provo/Orem Option B				60.43

Note: Acreages are based on wetland impact table dated April 28, 2008.

A summary of the wetland values for wetlands and other waters of the United States potentially impacted as a result of implementing Alternative 4 is provided in Table 3.14-7. Less than one-half acres of high value wetlands would be impacted by the 43-mile long project under any of the options. The majority of impacts are to lower functioning Category 3 wetlands.

Table 3.14-7: Comparison of Affected Wetland Values by Design Option

Section / Option	Category 1	Category 2	Category 3	Category 4	Total
Section Totals					
South Utah County	0.46	0.47	8.21	0.00	9.14
Central Utah County					
With Option A	0.00	0.00	38.03	0.06	38.09
With Option B	0.00	0.00	38.24	0.06	38.30
With Option C	0.00	0.00	29.97	0.06	30.03
With Option D (Preferred)	0.00	0.00	27.30	0.06	27.36
North Utah County					
With Option A Diamond	0.00	4.69	4.76	0.00	9.45
With Option B South SPUI	0.00	7.81	4.15	0.00	11.96
With Option C North SPUI (Preferred)	0.00	5.49	3.93	0.00	9.42
South Salt Lake County	0.00	0.00	1.03	0.00	1.03
TOTAL PROJECT IMPACTS (range from lowest to highest)	0.46	5.16 to 8.28	33.42 to 45.95	0.06 to 0.13	46.95 to 60.43 acres

3.14.4.6 Indirect Impacts

The project by itself is not expected to cause any more growth than what is already projected by the Governor's Office of Planning and Budget, and that is incorporated in city plans and long range plans. The project may, however, affect the pace of projected growth and influence the nature of development. Many of the indirect impacts that could result from such a transportation project are a combination of social, economic influences that are independent of transportation facilities. Indirect effects are expected to be controlled by local-land-use policy as reflected in general zoning plans.

The Preferred Alternative also requires a small re-alignment of American Fork Main Street. The remainder of the project is along well-developed and long-established corridor, where minimal indirect environmental impacts can be expected.

The permitting requirements associated with Section 404(b)(1) guidelines governing the U.S. Army Corps of Engineers' permit are limited to requiring mitigation for indirect impacts that are specific and predictable in terms of location and degree. More generalized indirect impacts such as those associated with possible future growth in a region do not require mitigation by FHWA or UDOT. In the event that future development results in wetland impacts, the proponent of the development is required to mitigate those impacts.

Potential indirect effects to wetlands that are in close proximity to I-15 are listed below:

- During construction, ground disturbance may create potential for wind-blown dust and for erosion of sediments into wetlands located adjacent to I-15, which could adversely affect wetland hydrology and vegetation.
- Soil disturbance and removal of existing vegetation would potentially increase the potential for the spread of invasive exotic plant species into adjacent wetlands.
- Construction materials, such as fuel, oil, lubricants, and concrete that may be spilled into adjacent wetlands, could have adverse affects on vegetation and aquatic invertebrates.
- The additional impervious surface area created by Alternative 4 will need to be de-iced in the winter and thus would increase the amount of de-icing substances used (salt, sand, other substances). However, runoff from the roadway is being captured and detained in detention basins which will include oil and grease skimmers.

Some of these effects would be short-term, such as construction impacts. Section 3.18.10 of this chapter specifies mitigation measures that would be required during construction to protect wetlands.

Other effects, such as runoff of contaminants, would be ongoing, continual effects. Other impacts, such as barriers to water flow or wildlife movement, are existing effects of the highway, and the new lanes would not be expected to add substantially to these indirect effects.

3.14.5 Avoidance and Minimization

The wetlands adjacent to the existing I-15 corridor were identified and mapped and incorporated into the engineering mapping. This enabled development of conceptual engineering that could avoid wetlands and minimize impacts to those that could not be avoided.

Where wetlands could not be avoided and would be impacted by the proposed project, the typical cross-sections described in Chapter 2 were used to reduce the footprint of Alternative 4 and minimize impacts to wetlands. This cross-section incorporates a retaining wall on the edge of shoulder and, where side slopes are needed, a steepening of side slopes from 1:6 to 1:2. This approach resulted in the minimization of impacts to 19 wetlands adjacent to I-15. Without this minimization, over 5 acres of additional wetlands would have been impacted by Alternative 4.

Between the DEIS and FEIS an I-15 mainline alignment shift in the Provo/Orem area reduced wetland impacts for Option D. At American Fork Main Street (Option C) wetland impacts were reduced by an alignment shift of the cross street and the addition of new retaining walls.

3.14.6 Mitigation

Although the Preferred Alternative is the least environmentally damaging, practicable alternative, adverse effects will result (Section 3.14). In addition to limited on-site mitigation, the wetland mitigation plan for this project will include use of a wetland mitigation bank that UDOT is currently developing with the USACE. Plans for the mitigation bank are not yet complete, but some of the known details are listed below:

- A Mitigation Bank Review Team (MBRT) has been formed consisting of members from USACE, EPA, USFWS, FHWA, DWR, and UDOT to oversee the development of a wetland mitigation bank in Utah County. The MBRT supports the wetland mitigation bank as a preferred approach to mitigate unavoidable wetland impacts.
- The bank will be developed to mitigate the various wetland types (wet meadow, marsh, shrub-scrub, and forested wetlands) impacted by the project and mitigate the wetland functions (hydrology, biogeochemistry, and flora and fauna) provided by those wetlands.
- Sites are currently being investigated near Utah Lake for their potential to be successful wetland banks and more details will be disclosed as soon as they are determined by UDOT, FHWA, and the USACE.
- The service area for the bank extends from the Utah/ Salt Lake County line to SR-75 in Springville.

In addition to compensatory mitigation, other protective measures include:

- Where wetlands are present adjacent to the limits of disturbance, UDOT will install protective fencing at the limits of the construction area, outside which all construction activities will be excluded. This will prevent incidental adverse effects on adjacent wetlands.
- In areas with shallow groundwater or areas that frequently carry surface water flows, UDOT will install culverts or other water conveyance structures to maintain existing hydrologic connectivity. This will avoid impacts on wetland hydrology.
- BMPs will be utilized during all phases of construction, including permanent BMPs after construction, including berms, brush barriers, check dams, erosion control blankets, filter strips, sandbag barriers, sediment basins, sheet mulching, silt fences, surface roughening, or diversion channels. These will reduce impacts from sedimentation and erosion.

The contractor will be required to comply with the conditions of the USACE Section 404 permit and UDOT Standard Specification 01574 Environmental Control Supervisor and 01571 Temporary Environmental Controls.

Many of the mitigation measures specified to protect water quality and vegetation during construction will also serve to protect wetlands. In addition, the following wetland protection and impact avoidance measures will be implemented:

- Before construction begins, wetland and riparian areas outside the limits of disturbance will be marked by perimeter environmental fencing to identify the no-work area.
- Free flow of waters into and across wetlands will be maintained by installing culverts at existing grade.
- Embankments, bridges, and culverts will be designed to minimize adverse impacts on wetlands, riparian areas, and drainages.
- When construction activities commence, administrative and environmental controls will be in place to ensure that wetland/riparian areas outside the limits of disturbance are not impacted.
- Erosion control measures will be used to ensure that sediment from construction areas does not reach wetlands, riparian areas, or streams.

- Any changes to the construction plans by either the contractor or UDOT will require review and approval by the appropriate State or Federal agency if there is the potential for impacts on wetlands or waters of the U.S. not previously identified.
- Contract specifications will ensure that all contractors are aware of Section 404 and Stream Alteration Permit conditions and of the various plans and measures developed to control and minimize wetland, riparian, and stream alteration impacts during construction. UDOT will monitor contractor activities to ensure all permit conditions are met.
- Restoration of temporarily disturbed wetlands will include rough grading, if necessary, and re-vegetation to approximate pre-project conditions.

Taking into account these avoidance, minimization, compensation and mitigation measures, the Preferred Alternative will be in compliance with Section 404 of the CWA and Executive Order 11990.

3.15 Wildlife, Threatened and Endangered Species, and Special-Status Plants

This section describes the wildlife resources, threatened and endangered species, and special-status plant species that have the potential to occur in the project and regional study areas. It has been based in part on a Biological Assessment prepared for the FWS. Existing conditions and potential project-related impacts on wildlife and sensitive species, including threatened and endangered species, were analyzed at two geographic levels: the project level (project study area) and the regional level (regional study area). These areas are described below and shown in Figures 3.15-1 and 3.15-2.

The project study area (Figure 3.15-1) is located along the I-15 Corridor from South Payson (Utah County) north to the 12300 South Interchange in Draper (Salt Lake County). The project study area includes the area within 1,320 feet on either side of the existing I-15 Corridor between the interchanges and 2,640 feet on either side of the corridor at or in the vicinity of each existing or proposed interchange. The project study area encompasses approximately 39,139 acres, the total area for which geographic information system (GIS) data were available to identify the various sensitive species habitats.

The study area for the regional-level analysis was defined by a subset of the Jordan River and Utah Lake U.S. Geological Survey (USGS) hydrologic units below 4,700 feet in elevation. This study area boundary includes wetland habitats associated with Utah Lake (Figure 3.15-2) that could potentially be used by migrating birds that also use the project study area.

Threatened and endangered species and special-status species include those recognized under state or federal authority as being of concern with regard to their long-term viability in the region. The regulatory setting and different status classifications of these species are described. Table 3.15-1 lists and describes these species (except migratory species) and identifies the federal and/or state status of each.

3.15.1 Regulatory Setting

The following federal and state laws guide regulatory authority over special-status plants and wildlife species that are known to occur or potentially could occur in the project and regional study areas. Special-status species for Utah and Salt Lake counties are shown in Table 3.15-1. A description of these species and their occurrence in the study area is discussed in Section 3.15.2.1.

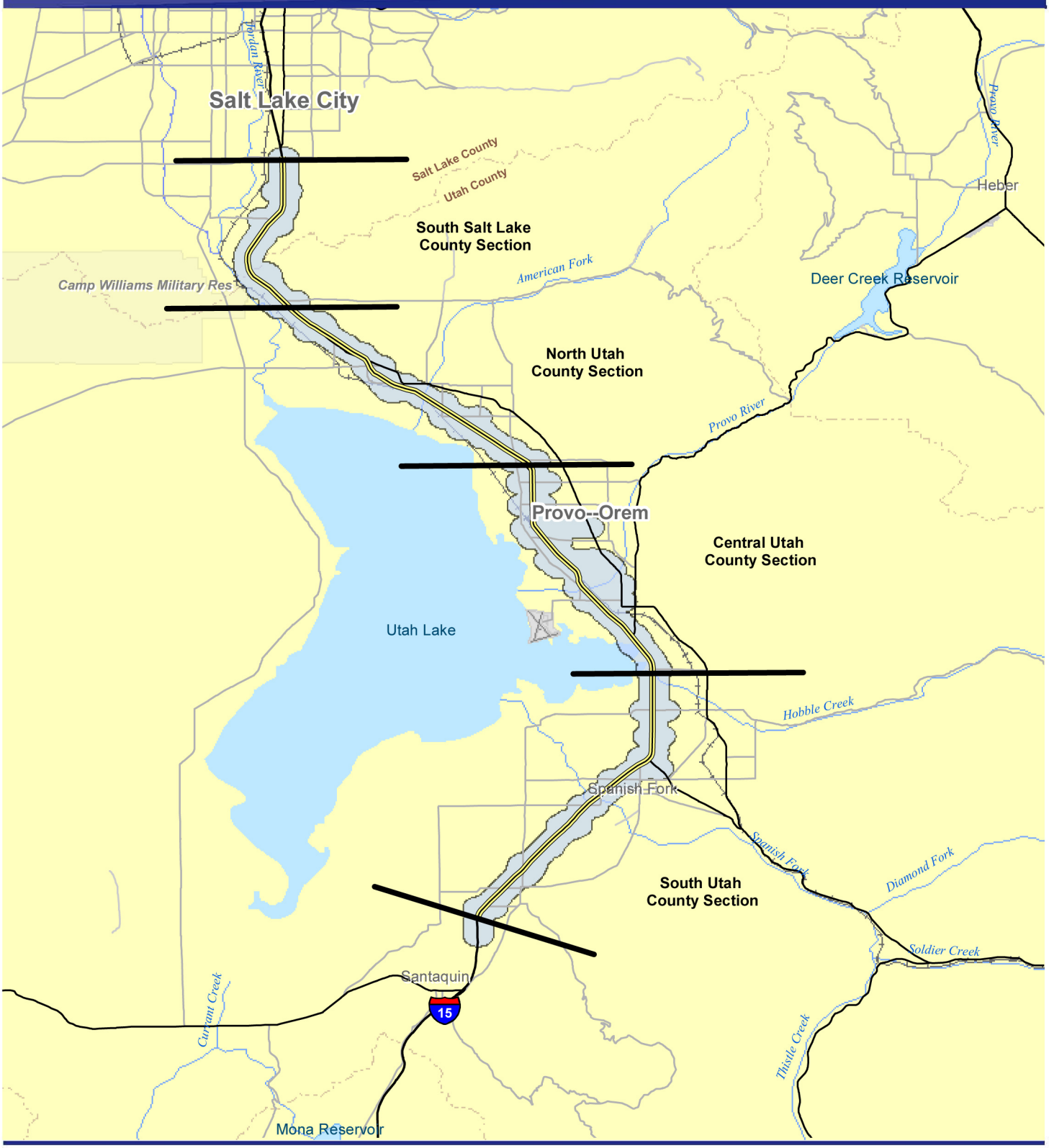


Figure 3.15-1

Wildlife and Special Status Species Project Study Area

LEGEND:

I-15 Corridor | Wildlife and Special Status Species Project Study Area

N

0 2.5 5 Miles

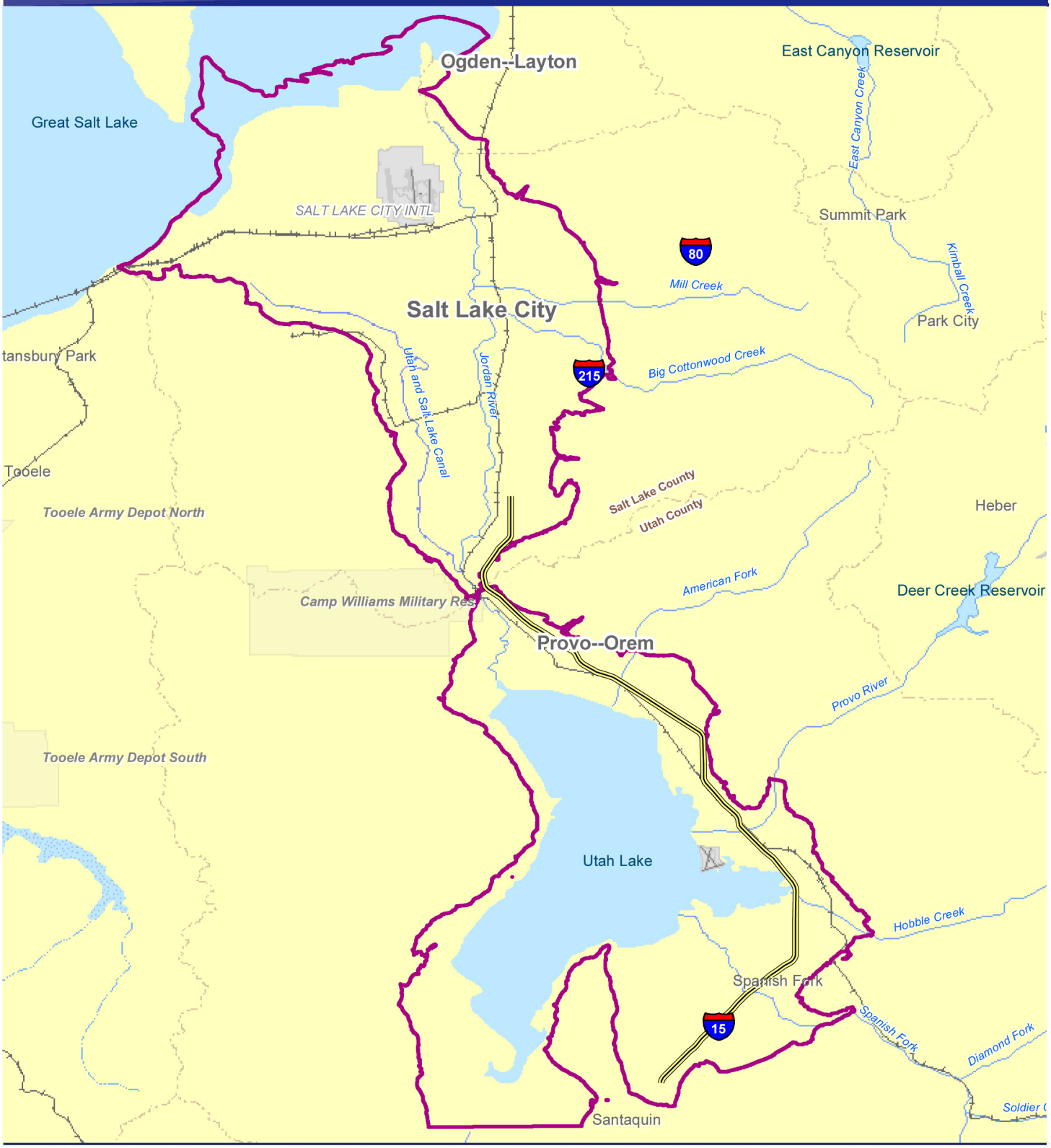


Figure 3.15-2

Wildlife and Special Status Species Regional Study Area

LEGEND:

I-15 Corridor Regional Study Area

0 2.5 5 10 Miles

N

Table 3.15-1: Special-Status Species for Utah and Salt Lake Counties

Species Common Name	Species Scientific Name	Federal Status	Utah State Status
Plants			
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened	None
Clay Phacelia	*Phacelia argillacea*	Endangered	None
Deseret Milkvetch	*Astragalus desereticus*	Threatened	None
Fish			
June Sucker	*Chasmistes liorus*	Endangered	Sensitive Species
Leatherside Chub	*Gila copei*	None	Sensitive Species
Bluehead Sucker	*Catostomus discobolus*	None	Conservation Agreement Species
Bonneville Cutthroat Trout	*Oncorhynchus clarkii*	None	Conservation Agreement Species
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	Delisted*	Sensitive Species
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Candidate	Sensitive Species
Northern Goshawk	*Accipiter gentilis*	None	Conservation Agreement Species
Ferruginous Hawk	*Buteo regalis*	None	Sensitive Species
Long-billed Curlew	*Numenius americanus*	None	Sensitive Species
Lewis' Woodpecker	*Melanerpes lewis*	None	Sensitive Species
American White Pelican	*Pelecanus erythrorhynchos*	None	Sensitive Species
Burrowing Owl	*Athene cunicularia*	None	Sensitive Species
Short-eared Owl	*Asio flammeus*	None	Sensitive Species
Bobolink	*Dolichonyx oryzivorus*	None	Sensitive Species
Grasshopper Sparrow	*Ammodramus savannarum*	None	Sensitive Species
Black Swift	*Cypseloides niger*	None	Species of Concern
Greater Sage Grouse	*Centrocercus urophasianus*	None	Species of Concern
Amphibians			
Columbia Spotted Frog	*Rana luteiventris*	None	Conservation Agreement Species
Western (Boreal) Toad	*Bufo boreas*	None	Sensitive Species

Table 3.15-1: Special-Status Species for Utah and Salt Lake Counties – continued

Species Common Name	Species Scientific Name	Federal Status	Utah State Status
Mammals			
Fringed Myotis	*Myotis thysanodes*	None	Sensitive Species
Spotted Bat	*Euderma maculatum*	None	Sensitive Species
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	None	Sensitive Species
Kit Fox	*Vulpes macrotis*	None	Sensitive Species
Brown (Grizzly) Bear	*Ursus arctos*	Threatened (Extirpated)	None
Canada Lynx	*Lynx canadensis*	Threatened	Sensitive Species
Mollusks			
California Floater	*Anodonta Californiensis*	None	Species of Concern
Desert Valvata	*Valvata utahensis*	Endangered (Extirpated)	None
Eureka Mountain Snail	*Oreohelix eurekensis*	None	Species of Concern

Note:
The special-status species that occur or could occur in project and regional study areas are discussed further in Section 3.15.2.1. The State Wildlife Species of Concern list by county is located at the following URL: http://dwrcdc.nr.utah.gov/ucdc/default.asp.

* The U.S. Fish and Wildlife Service (USFWS) published the removal of the Bald Eagle from the list of threatened and endangered species on July 9, 2007, in the Federal Register (72 FR 37346). USFWS will monitor the Bald Eagle population status for a minimum of 5 years after delisting, as required by the Endangered Species Act. The Bald Eagle will continue to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Sources: Utah Division of Wildlife Resources 2007a, 2007b.

3.15.1.1 Federal

Endangered Species Act (16 United States Code [USC] 1531 et seq.)

Under Section 7 of the federal Endangered Species Act (ESA), federal agencies are required to ensure that their actions do not jeopardize the continued existence of species listed as endangered or threatened, or result in destruction or adverse modification of designated critical habitats used by those species. An endangered species is a species that is in danger of extinction throughout all or a significant part of its range. Threatened species are likely to become endangered in the foreseeable future throughout all or a significant part of their range. Candidate species are plants and animals for which sufficient information exists on their biological vulnerability and threats to support a proposal to list them as endangered or threatened under the ESA, but for which development of a listing regulation is precluded by other higher-priority listing activities. State and federal agencies typically carry out conservation actions for candidate species to prevent further decline and possibly eliminate the need for future listing.

Section 9 of the ESA makes it unlawful for a person to take a listed species, where *take* is defined as "[to] harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC

1532). Further, the term *harass* is defined as an intentional or negligent act that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering (50 Code of Federal Regulations [CFR] 17.3). *Harm* is an act that either kills or injures a listed species. Such an act may include habitat modification or degradation that actually kills or injures a listed species by significantly impairing essential behavior patterns such as breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 217.12). Habitat degradation can cause take through either harm or harass pathways. Acceptable levels of incidental take may be allowed under the authorities of Sections 4(d), 7(b), and 10(a) of the ESA. USFWS is one of the federal agencies that administers the ESA and has primary responsibility for terrestrial and freshwater species.

As shown in Table 3.15-1, one endangered species (June Sucker), one threatened species (Ute ladies'-tresses), one candidate species (Yellow-billed Cuckoo), and one recently delisted species (Bald Eagle) occur or may occur in the project study area. USFWS published the removal of the Bald Eagle from the list of threatened and endangered species on July 9, 2007, in the Federal Register (72 FR 37346). USFWS will monitor the Bald Eagle population status for a minimum of 5 years after delisting, as required by the Endangered Species Act. The Bald Eagle will continue to be protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). A biological assessment (BA) has been prepared pursuant to ESA Section 7 to evaluate the potential impacts of Alternative 4 on the June Sucker.

Migratory Bird Treaty Act (16 USC 703–711)

The federal MBTA prohibits the take of any migratory bird or any part, nest, or egg of any such bird, where *take* is defined as an attempt to "pursue, hunt, shoot, capture, collect, or kill." This act applies to all persons and organizations in the United States, including federal and state agencies. The MBTA is administered by USFWS, with regulation of listed migratory birds delegated to the agency staff handling Section 7 of the ESA, and regulation of unlisted migratory birds delegated to the USFWS Migratory Bird Division.

Bald and Golden Eagle Protection Act (16 USC 668-668d)

The federal BGEPA provides for the protection of the Bald Eagle and the Golden Eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds, alive or dead, including any part, nest, or egg. The term "take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." The BGEPA is administered by the U.S. Department of the Interior.

Fish and Wildlife Conservation Act (16 USC 2901–2911)

The Fish and Wildlife Conservation Act, as amended, mandates that USFWS identify migratory and nonmigratory birds of the United States and its territories that, without additional conservation actions, are likely to become candidates for listing under the ESA. These species include ESA candidate, proposed endangered or threatened, and recently delisted species (U.S. Fish and Wildlife Service 2002).

3.15.1.2 State of Utah

State of Utah conservation agreement species (CASs) and wildlife species of concern (WSCs) included on the Utah sensitive species list for Utah and Salt Lake counties are shown in Table 3.15-1 and discussed in Section 3.15.1.2. No plants identified on the Utah sensitive species list occur in the project study area.

Conservation Agreement Species

Conservation agreements are formal agreements between USFWS and one or more parties to address the conservation needs of species that are candidates or proposed for listing as endangered or threatened, or species likely to become candidates, before they become listed. The participants voluntarily commit to implementing specific actions that will remove or reduce the threats to these species, thereby contributing to stabilizing or restoring the species so that listing is no longer necessary. Conservation agreements may include plants and animals that have

been proposed or are candidates for listing. Species that are likely to become candidate or proposed species in the near future may also be included in a conservation agreement.

Utah Wildlife Sensitive Species (Utah Administrative Rule R657-48)

Wildlife species that are federally listed, candidates for listing, or for which a conservation agreement is in place automatically qualify for the Utah Sensitive Species List (Utah Division of Wildlife Resources 2006). Additional species on the list are those for which there is credible scientific evidence to substantiate a threat to continued population viability in Utah. Sensitive species designations are intended to promote conservation actions that would ultimately prevent the species from being listed as threatened or endangered under the ESA. The Utah Division of Wildlife Resources (UDWR) is the state agency responsible for monitoring WSCs.

3.15.2 Affected Environment

3.15.2.1 Description of Special-Status Species

Only the special-status species that occur or could occur in project and regional study areas are discussed in relationship to the project corridor. No further discussion is included in this EIS for the clay phacelia, deseret milkvetch, bluehead sucker, Bonneville cutthroat trout, black swift, greater sage grouse, brown (grizzly) bear, Canada lynx, California floater, desert valvata, or Eureka mountain snail because they do not occur in habitat or geographic areas that could be affected by project activities.

Ute Ladies'-tresses (Spiranthes diluvialis)

Ute ladies'-tresses is a perennial, terrestrial orchid with stems 8–20 inches tall, arising from tuberously thickened roots. The species is characterized by whitish, stout, ringent (gaping at the mouth) flowers. It generally blooms from late July through August (U.S. Fish and Wildlife Service 2004). Populations of Ute ladies'-tresses have been documented in north-central and western Utah and portions of Colorado, Idaho, Montana, Nebraska, Nevada, Washington, and Wyoming (Utah Division of Wildlife Resources 2007b). It occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows. It typically occurs in stable wetland and seep areas associated with old landscape features within historical floodplains of major rivers. It also can be found in wetland and seep areas near freshwater lakes or springs.

The Ute ladies'-tresses has been reported from 14 locations in Utah County, including locations near the project vicinity in Lehi, American Fork, Springville, Spanish Fork, and Payson (Fertig et al. 2005; HDR 2007). These populations were reported to occur in wet meadows, usually in floodplains, between 4,490 and 5,460 feet in elevation. However, two project-level pedestrian presence/absence surveys of wet meadow habitat along the I-15 Corridor detected no Ute ladies'-tresses within the project study area. Therefore, the species is presumed to be absent from the project study area.

June Sucker (Chasmistes liorus)

The June Sucker is endemic to Utah Lake and its tributaries, although it has been introduced into other lakes for genetic reserves. The June Sucker was listed by USFWS as a federally endangered species on March 31, 1986 (51 Federal Register [FR] 10851). Critical habitat was designated at the same time, consisting of the lower 4.9 miles of the Provo River from the Tanner Race Diversion downstream to Utah Lake. Spawning only occurs in the Provo River at present, but also occurred in the Spanish Fork River and possibly in Hobble Creek. June Suckers are a long-lived fish (9–43 years) and can grow up to 24 inches. Young June Suckers prefer to use aquatic vegetation for cover; however, there is currently insufficient aquatic vegetation in the Provo River for adequate cover. The June sucker is most likely a mid-water planktivore and they are both discriminate and opportunistic feeders. Post-spawning adults inhabit all areas of Utah Lake, but most likely use the shallow habitat over deep-water habitat. June Suckers are potadromous (i.e., they migrate in freshwater systems, rearing in the lake and spawning in the river). The proposed project area crosses the Provo River within USFWS-designated June Sucker critical habitat.

Leatherside Chub (Gila copei)

Leatherside chub is a minnow native to Utah Lake and the Provo River, often used for bait by fishermen. The name is derived from its skin, which has a leathery texture. Adults measure 3–5 inches in length and live no longer than 5 years. Although their ecology is not well known, it is assumed that they feed on drift organisms, algae, and aquatic insects. Leatherside chub most likely spawn from June to August, when water temperatures are between 60 and 68ºF. Adults inhabit pools and riffles or cool creeks and rivers, while young live in quiet waters, including where water is slowed down by brush. Dominant substrate is gravel but may also contain sand, cobble, and silt (Sigler and Sigler 1987). Leatherside chub has most likely been extirpated from the lower reaches of the Provo River[1] and is not known to occur within the project study area.

Bald Eagle (Haliaeetus leucocephalus)

The Bald Eagle was removed from the list of threatened and endangered species on July 9, 2007 (72 FR 37346). USFWS will monitor the Bald Eagle population status for a minimum of 5 years after delisting, as required by the ESA. The Bald Eagle will continue to be protected under the MBTA and the BGEPA. Bald Eagles are common winter visitants but rare summer breeders in the regional study area. Bald Eagles are opportunistic feeders that forage on carrion and prey on a variety of mammals, birds, reptiles, amphibians, and crustaceans. However, they generally prefer fish, when available, to other food types (Buehler 2000). Bald Eagles eat a great variety of fish; aquatic and terrestrial mammals, including muskrats, jackrabbits, and ground squirrels; and many species of waterfowl, gulls, and even Great Blue Herons (Buehler 2000). Foraging habitat for Bald Eagles occurs within the project study area. Utah Lake, especially along the shore and in delta bays, and the Jordan River provide good habitat for Bald Eagles to prey on a variety of fish, including carp, suckers, and catfish.

Yellow-billed Cuckoo (Coccyzus americanus occidentalis)

The taxonomy of Yellow-billed Cuckoo subspecies is currently being debated. Most authors have recognized both an eastern (*Coccyzus americanus americanus*) and western (*C. a. occidentalis*) subspecies (American Ornithologists' Union 1957). Only the Western Yellow-billed Cuckoo occurs in Utah (Behle and Perry 1975). The Yellow-billed Cuckoo in the western United States is classified as a federal candidate species (67 FR 71193, 71194). Yellow-billed Cuckoos historically bred along the riparian corridors of the Great Salt Lake Basin (U.S. Fish and Wildlife Service 2002). The Jordan River and delta once provided large areas of habitat suitable for cuckoos (Utah Division of Wildlife Resources 2003). However, habitat loss and fragmentation from dewatering, stream channelization, encroachment by non-native tamarisk, grazing, and oil and gas development have removed most of this species' historical habitat. The current breeding range for Yellow-billed Cuckoos in Utah includes Salt Lake, Tooele, and Washington counties. Preferred breeding habitat in this area includes riparian woodlands characterized by willow, Fremont cottonwood (*Populus fremontii*), and dense mesquite (Walters 1983; Hughes 1999). Nests are commonly placed in willows, but cottonwoods are used extensively for foraging. Migrant Yellow-billed Cuckoos may rest and forage in human-modified habitats, including fruit orchards and suburban/urban/rural shade trees and gardens. The principal foods of this species are large insects, including caterpillars, cicadas, grasshoppers, and crickets (Hughes 1999). Small frogs, eggs and young of other birds, and fruit and seeds are also eaten on occasion. Nesting and foraging habitat for the Yellow-billed Cuckoo occurs within the regional study area.

Northern Goshawk (Accipiter gentilis)

The Northern Goshawk occurs as a permanent resident throughout Utah but is not common in the state. Northern Goshawks are rare migrants in the project study area but are more abundant in the higher forested reaches of the watersheds of Utah Lake, the Great Salt Lake Basin, and elsewhere in Utah. Ryser (1985) noted that in the Great Basin Physiographic Province, during winter, there is some altitudinal migration of goshawks from mountain forests

[1] Wilson, Krissy. Aquatic Biologist, Utah Department of Natural Resources, Division of Wildlife Resources. Telephone conversation regarding fisheries resources in the project area—October 5, 2004.

into the foothills and valleys, as well as immigration of individuals into the Great Basin from the north. Goshawks have been observed foraging in open sagebrush areas in Nevada, where they prey on ground squirrels (Younk and Bechard 1992). Also, wintering goshawks use cottonwood riparian areas in the Rocky Mountains and Intermountain Region (Squires and Ruggiero 1995), as well as adjacent open areas (Hughes 1999). Northern Goshawks prey mostly on large passerine birds, grouse, woodpeckers, corvids, squirrels, rabbits, and hares (Squires and Reynolds 1997). Foraging habitat for the Northern Goshawk occurs within the regional study area.

Ferruginous Hawk (Buteo regalis)

Ferruginous Hawks breed in western North America, from south-central Canada to northern Utah and New Mexico (Olendorff 1993). The species winters primarily in grasslands and shrub steppes in the western and central United States, as well as in Mexico. These hawks typically occur in flat and rolling terrain in grassland or shrub-steppe regions (Bechard and Schmutz 1995), including grasslands, sagebrush country, saltbush-greasewood shrublands, and along the periphery of western pinyon and other forests (Olendorff 1993). Nest sites tend to be at elevated sites such as boulders, knolls, low cliffs, trees, large shrubs, and utility structures. While foraging, these hawks commonly perch in trees; on telephone and power line poles, farm buildings, fence posts, or outcrops; or on the ground. Their principal prey includes jackrabbits, cottontail rabbits, ground squirrels, and gophers (Olendorff 1993; Bechard and Schmutz 1995). Foraging habitat for Ferruginous Hawk occurs within the regional study area.

Long-billed Curlew (Numenius americanus)

Long-billed Curlews are uncommon breeders and common migrants in the regional study area. They typically forage in higher and drier meadowlands than many other shorebirds, preferring areas with mixed short grass cover and bare ground components. Long-billed Curlews breed or forage in shallow open water, cropland, pasture, and wet meadow habitats. Uncultivated rangelands and pastures, as well as rice and alfalfa fields, support most of the Long-billed Curlew populations throughout the western United States (Dugger and Dugger 2002). Curlews feed on a variety of crustaceans, mollusks, worms, frogs and toads, insects, and berries. Foraging habitat for the Long-billed Curlew occurs within the project study area.

Lewis' Woodpecker (Melanerpes lewis)

Lewis' Woodpeckers are uncommon permanent residents in Utah. Although it has been functionally extirpated from much of its historical breeding range along the Wasatch Front, the species is occasionally observed in the regional study area. Three principal habitats are open ponderosa pine forest, open riparian woodland dominated by cottonwood, and logged or burned pine forest. However, breeding birds are also found in oak woodland, nut and fruit orchards, pinyon pine-juniper woodland, a variety of pine and fir forests, and agricultural areas, including farmland and ranchland. Important aspects of breeding habitat include an open canopy, a brushy understory offering ground cover and abundant insects, dead or downed woody material, available perches, and abundant insects. Their diet during the warmer months consists largely of flying insects caught during flight. During colder months, their diet shifts to nuts, grains, and berries.

American White Pelican (Pelecanus erythrorhynchos)

A breeding colony of American White Pelicans occurs on Gunnison Island in the north arm of the Great Salt Lake (Aldrich and Paul 2002). Exceeding 20,000 in some years, this colony is one of the largest breeding populations in North America. American White Pelicans from this colony are common visitors to Utah Lake and large ponds within the regional study area. They are found almost exclusively in open water habitat and open emergent marshes, where they feed on fish.

Burrowing Owl (Athene cunicularia)

Burrowing Owls are rare breeders in the regional study area. During the breeding season, they prefer dry, open shortgrass habitats, generally without trees. They are typically associated with burrowing mammals such as ground squirrels. Across their range, Burrowing Owls nest in burrows in pastures, agricultural fields, and vacant lots in

residential areas, golf courses, cemeteries, university campuses, and fairgrounds. Burrowing Owls are generally opportunistic feeders and prey on arthropods, small mammals, birds, amphibians, and reptiles (Haug et al. 1993).

Short-eared Owl (Asio flammeus)

Short-eared Owls are breeders within the regional study area. They are associated with open country (e.g., grasslands and shrub-steppe habitat) (Holt and Leasure 1993). Short-eared Owls breed or forage in emergent marsh, cropland, pasture, salt desert scrub, and wet meadow habitats. Nest sites are typically on slight ridges in areas with enough vegetation to conceal the incubating female. During the nonbreeding season, these owls commonly forage and roost in large open woodlots, stubble fields, and shrub thickets. They feed primarily on small mammals (e.g., voles, deer mice, rats, shrews, rabbits, and pocket gophers) and a variety of birds (e.g., shorebirds, rails, gulls, terns, and passerines).

Bobolink (Dolichonyx oryzivorus)

Bobolinks are rare breeders in the regional study area. Bobolinks nest and forage in wet meadows, wet grasslands, and irrigated areas (primarily pasture and hay fields). Although historically common in northern Utah, Bobolinks are now rare in the state and their populations fluctuate unpredictably. During the breeding season, their diet includes weed and grain seeds, a variety of larval and adult insects, spiders, and harvestmen. The young are exclusively fed invertebrates. During migration, grain seeds are the staple diet, supplemented occasionally with insects (Martin and Gavin 1995).

Grasshopper Sparrow (Ammodramus savannarum)

Grasshopper Sparrows occur in the Great Basin region of Utah (McIvor 1998). They breed in shrub-steppe habitats in Utah and may nest or forage in wet meadow, cropland, and pasture habitats. Their preferred habitats in the western United States are lush portions of open grasslands that also include a sparse shrub component. Grasshopper Sparrows consume mostly large insects, such as grasshoppers, in summer. They capture insects exclusively on the ground; exposed, bare areas are required for successful foraging (Vickery 1996). Foraging habitat for Grasshopper Sparrow occurs within the project study area.

Columbia Spotted Frog (Rana luteiventris)

The Columbia spotted frog is found in mountainous habitats in or near cold, slow-moving streams, springs or marshes, ponds, and small lakes where emergent vegetation is not extensive. This species is likely to occur within the regional study area. It is active during the day and may cross terrestrial areas in spring and summer after breeding. It can be found in a range of habitats ranging from sagebrush benches to subalpine forests at elevations up to about 10,000 feet. Spotted frog adults are opportunistic feeders, consuming insects, mollusks, worms, and snails. The larvae are believed to feed on detritus, plant tissue, and organic debris.

Western (Boreal) Toad (Bufo boreas)

The western (boreal) toad historically occurred within the project study area (Shields and Moreitti 1982). It is not currently known to occur within the project or regional study area. It can be found in a variety of habitats, including slow-moving streams, wetlands, desert springs, ponds, lakes, meadows, and woodlands. Adults feed on numerous types of small invertebrates, such as ants, beetles, and grasshoppers, whereas larvae (tadpoles) filter algae from the water or feed on detritus. The western toad, which is inactive during cold winter months, may either dig its own burrow in loose soil or use the burrows of other small animals.

Fringed Myotis (Myotis thysanodes)

The foraging habitat of fringed myotis includes the regional study area (Zevellof and Collett 1988). Although this species is not currently known to occur within Utah and Salt Lake counties (it has been recorded from Tooele and Uintah counties on either side of Utah County) (Utah Division of Wildlife Resources 2003), it has the potential to occur within the regional study area. These bats inhabit a wide variety of environments, from desert scrub to

coniferous forests in the mountains. They typically roost in caves, mine tunnels, rock crevices, and old buildings (Davis and Schmidly 1994). They feed exclusively on insects, typically over water. Water courses and lowland riparian areas are very important to this species (Utah Division of Wildlife Resources 2003).

Spotted Bat (Euderma maculatum)

Very little is known about the distribution or biology of spotted bat populations in Utah. This species is considered one of North America's rarest mammals (Zeiner et al. 1990). The regional study area is within the known distribution of this species (Zeveloff and Collett 1988). The species occurs in a variety of habitats, but it has been collected most often in rough, desert-like terrain characterized by vertical cliffs suitable for roosting. Spotted bats often roost in caves and occasionally in buildings. Because no local distribution studies have been conducted, it is not known whether spotted bats utilize the project study area. This species has the potential to occur within the project study area.

Townsend's Big-Eared Bat (Corynorhinus townsendii)

Townsend's big-eared bats are common in the highlands of the western United States, often found in scrub plant communities, pinyon-juniper and pine forests, and deciduous woodlands (Zeveloff and Collett 1988). However, they appear to be generally uncommon in dry regions. Local distribution is closely tied to the presence of roosting caves, mines, or buildings within reasonable commute distances (up to 20 miles) of foraging areas (Pearson et al. 1952). Prey items include small moths, flies, lacewings, dung beetles, and sawflies (Davis and Schmidly 1994). Such features are likely present in many locations around Utah Lake, especially in the Wasatch Mountains and nearby desert hills. Foraging habitat for this species occurs within the project study area.

Kit Fox (Vulpes macrotis)

The regional study area is located near the extreme northeastern edge of the known distribution of kit fox (Zevellof and Collett 1988). Kit foxes are found throughout western Utah in desert and semiarid regions with flat shrub or shrub-grass communities with little ground cover. Where these foxes occur in the Great Basin, shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and sagebrush communities are common. Major prey items include desert rodents, jackrabbits, cottontail rabbits, ground-nesting birds, reptiles, and insects.

3.15.2.2 Methods Used to Describe the Affected Environment

The following methods were used to acquire information on the biological resources, including threatened and endangered species that occur in the project and regional study areas.

Habitat Mapping and Evaluation

Wildlife habitats within the project study area, including open water, riparian, emergent marsh, pasture, cropland, scrub, and developed (urban landscaping) areas within the project and regional study areas, were identified based on interpretation of recent aerial photographs of the area and GIS maps of land cover types, based on USGS National Land Cover and National Wetland Inventory (NWI) datasets. Figures 3.15-3 to 3.15-6 show the land cover types. A site visit of the project study area was conducted August 9 to 11, 2004, to assess general habitat distribution and conditions. The project study area was also evaluated for the occurrence of potential special-status wildlife habitat.

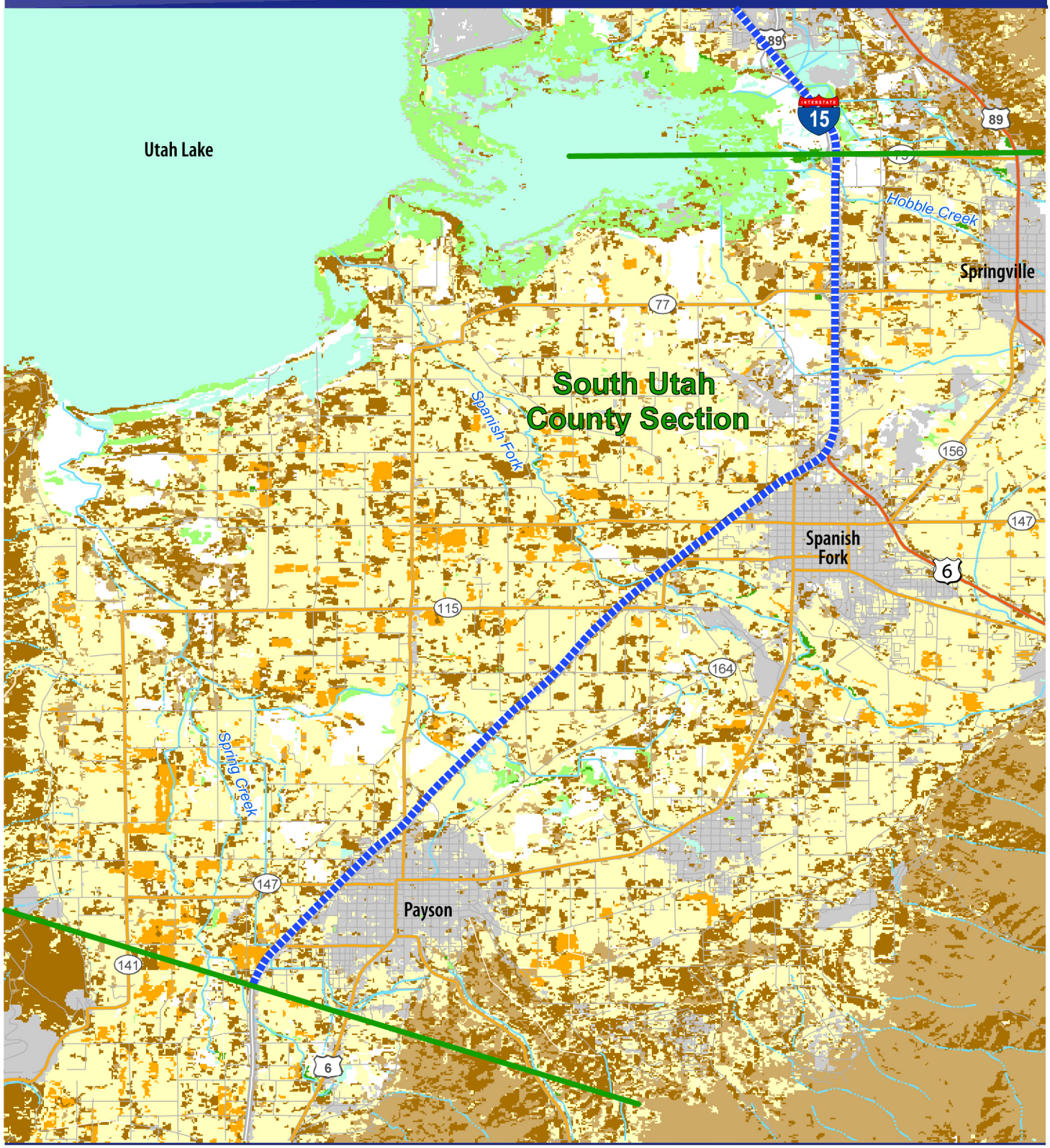


Figure 3-15.3

Land Cover in the Wildlife and Special Status Species Project Study Area - South Utah County Section

LEGEND:

- I-15 Corridor
- Cropland
- Developed
- EmergentMarsh
- OpenWater
- Pasture
- Riparian
- Scrub
- Unclassified
- Upland

0 1 2 Miles

N

Data Sources: USGS Natinoal Land Cover Dataset and USFWS National Wetlands Inventory

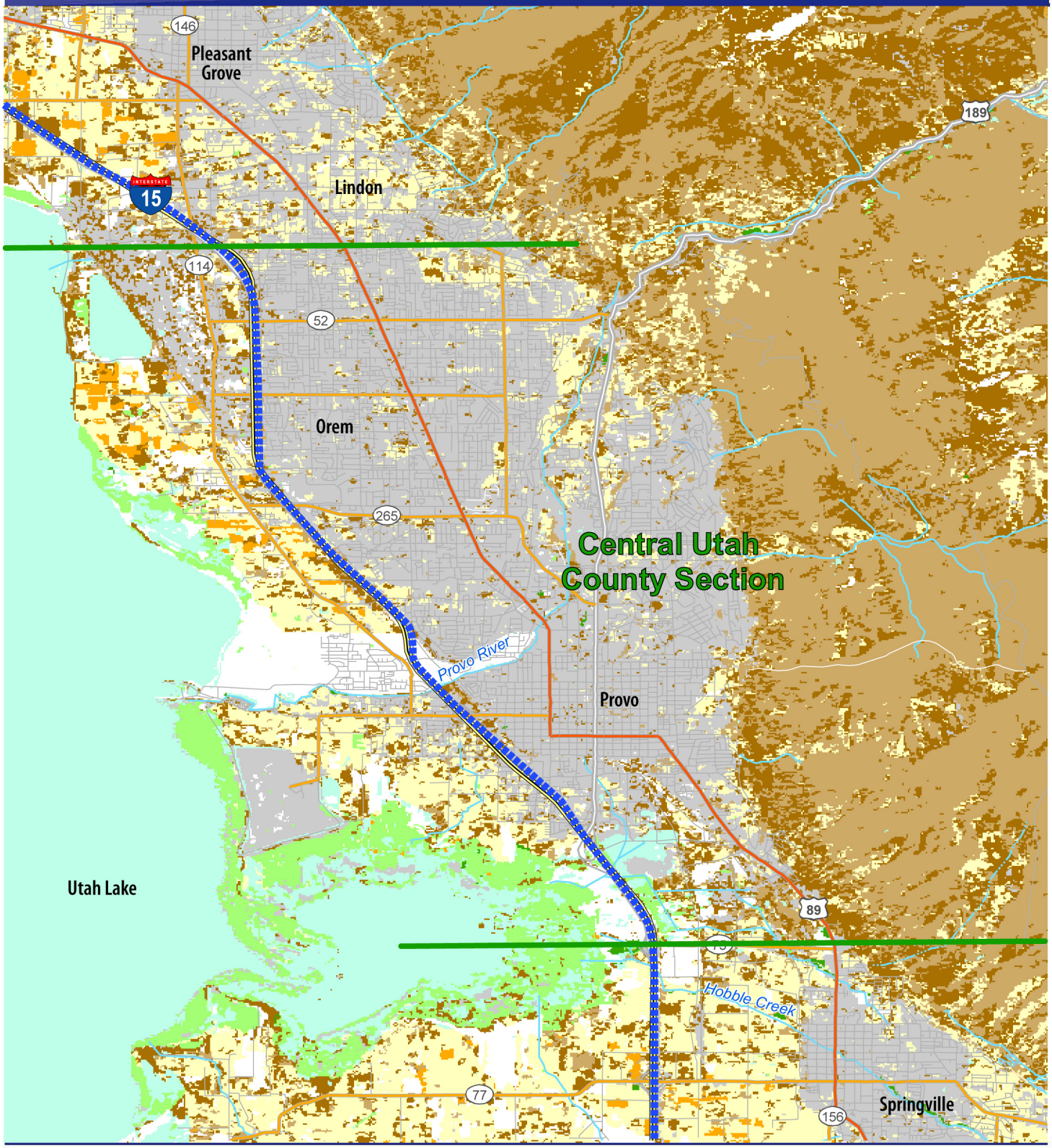


Figure 3-15.4

Land Cover in the Wildlife and Special Status Species Project Study Area - Central Utah County Section

LEGEND:

- I-15 Corridor
- Cropland
- Developed
- EmergentMarsh
- OpenWater
- Pasture
- Riparian
- Scrub
- Unclassified
- Upland

0 1 2 Miles

N

Data Sources: USGS Natinoal Land Cover Dataset and USFWS National Wetlands Inventory

Figure 3-15.5

Land Cover in the Wildlife and Special Status Species Project Study Area - North Utah County Section

LEGEND:

- I-15 Corridor
- Cropland
- Developed
- EmergentMarsh
- OpenWater
- Pasture
- Riparian
- Scrub
- Unclassified
- Upland

0 1 2 Miles

N

Data Sources: USGS Natinoal Land Cover Dataset and USFWS National Wetlands Inventory

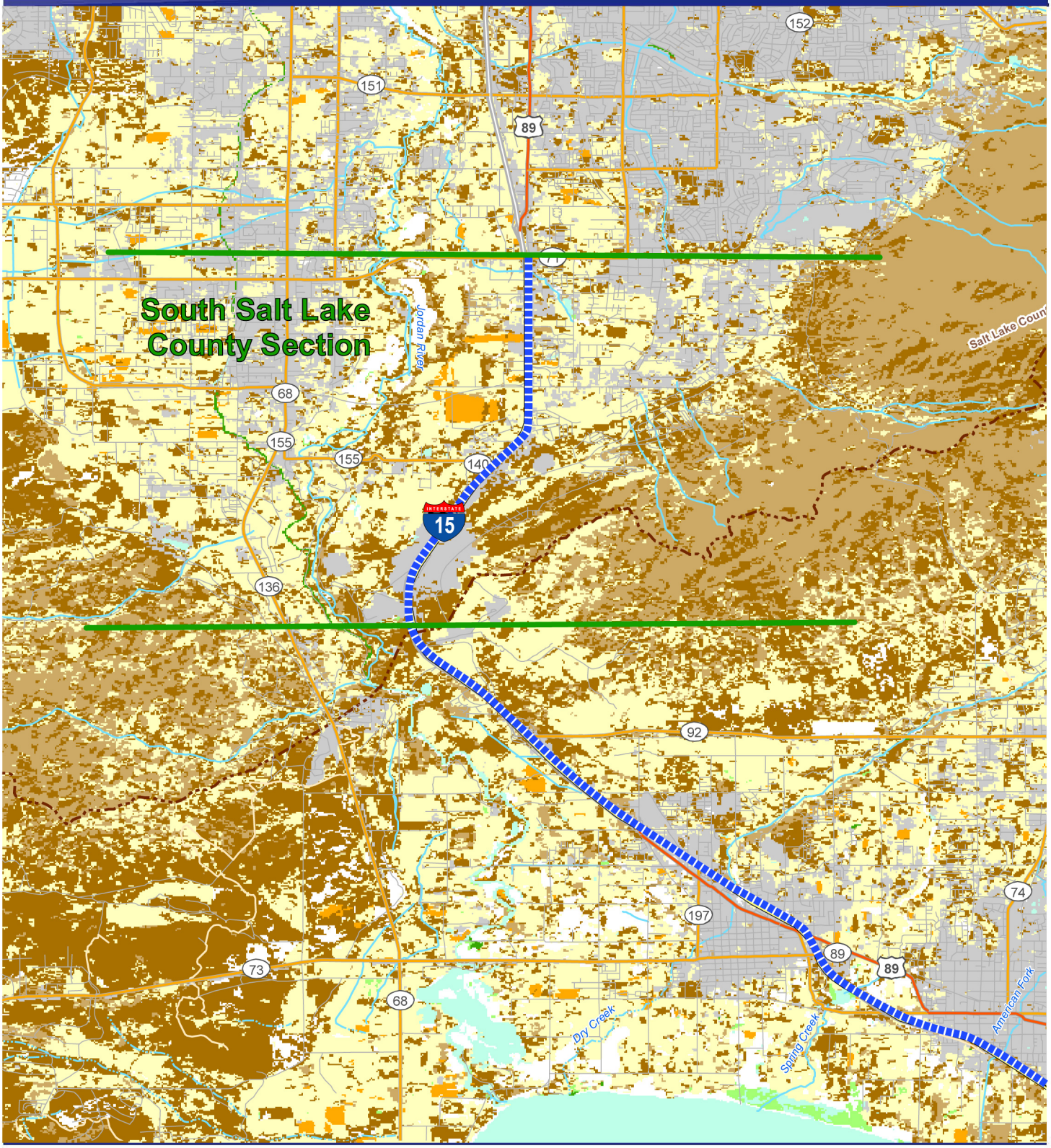


Figure 3-15.6

Land Cover in the Wildlife and Special Status Species Project Study Area - South Salt Lake County Section

LEGEND:

- I-15 Corridor
- Cropland
- Developed
- EmergentMarsh
- OpenWater
- Pasture
- Riparian
- Scrub
- Unclassified
- Upland

0 1 2 Miles

N

Data Sources: USGS Natinoal Land Cover Dataset and USFWS National Wetlands Inventory

Species Occurrence Status

Plant and wildlife species that occur or could potentially occur within the project and regional study areas were identified through a review of available species occurrence records and reports, and their general ecological status within these areas was assessed and described. Meetings were held with USFWS and UDWR on September 8, 2004, August 2, 2005, February 21, 2006, and May 17, 2007 to obtain additional information on special-status species that could occur in the study area. Additionally, coordination meetings between UDOT and USFWS were held on June 22, 2007 and July 27, 2007 regarding potential impacts to the June sucker.

Focused Special-Status Species Surveys

Focused surveys for Ute ladies'-tresses were conducted along the I-15 Corridor August 22 to 25 and September 6 to 9, 2005 and from August 13 to 31, 2007 (two seasons). During these surveys, searches for the species were conducted in potential habitat within 300 feet of the proposed project's limits of disturbance. The results of the surveys are documented in Section 3.15.3.2

3.15.2.3 Existing Wildlife Habitat Conditions

This section describes the existing biological conditions within the regional and project study areas, including sensitive species and their habitats. A description of historic conditions is included to provide context for the discussion of cumulative impacts later in this section.

Physical Setting

The project and regional study areas are located on the east side of Utah Lake, in Utah Valley, at the western base of the Wasatch Mountains. The Wasatch Mountains mark the eastern limit of the Great Basin Physiographic Province, which is characterized by a cold high-desert climate. The regional study area includes the Utah Lake and Jordan River Hydrological Units below 4,700 feet in elevation.

Utah Lake is a large, shallow freshwater lake covering more than 94,000 acres (Jackson and Stevens 1981; Fuhriman et al. 1981). The lake depth is 6 to 10 feet and is affected by seasonal fluctuations in the amount of water flowing into the lake. The streams that discharge into the lake primarily originate in the Wasatch and Uinta Mountains to the east. The lake is supported by four major streams (the American Fork River, Hobble Creek, the Provo River, and the Spanish Fork River), several minor perennial streams, and many intermittent streams. All four of the main streams supplying the lake cross the project study area. The area surrounding the lake is underlain by low-pressure artesian aquifers (see Section 3.12, *Water Resources*), and numerous springs are present in and near the lake (Fuhriman et al. 1981). Utah Lake's only outlet is the Jordan River.

Biological Setting

The existing habitats within the project study area exhibit extensive fragmentation today because of previous construction of railroad corridors, I-15, and other transportation facilities and because of other previous development and disturbance (e.g., urban/suburban development, farming, grazing, dikes, and fencing) within the project vicinity. These and other land use changes have resulted in marked wildlife habitat fragmentation along the Wasatch Front. In particular, they have resulted in the development of wildlife movement barriers between the Wasatch Mountains and Utah Lake and the Jordan River. Road networks in the intervening uplands, conversion of land to agricultural use, and urban development have fragmented significantly historic wildlife habitats in the area. The wildlife populations in the project vicinity are likely to have already experienced many of the population changes typically associated with habitat fragmentation (e.g., reduced carrying capacity, lower reproductive success, and higher susceptibility to predation). Existing conditions represent highly modified populations from historic conditions. Based on observed changes in other fragmented wildlife populations described in the literature (e.g., Soulé 1987; Forman 1995; Primack 2000), it is presumed that wildlife in the project vicinity has experienced reduced species diversity, population density, and distribution in response to the cumulative long-term effects of these land use changes.

The existing I-15 facility does experience some incidental road kill, primarily of small mammals. However, vehicle collisions with larger mammals occasionally occur.

Utah Lake and the Jordan River provide important habitat for a great variety of amphibians, reptiles, birds, and mammals, some of which are considered rare or have small geographical distributions. More than 347 wildlife species, including 17 fish, six amphibians, ten reptiles, 244 birds, and 70 mammals, have been documented as occurring within the project and regional study areas or have the potential to occur based on the presence of suitable habitat and the general abundance of the species in the region (Utah Division of Wildlife Resources 2007a and 2007b; Jones & Stokes 2005). Of these species, 252 (239 birds and 13 bats) are migratory. Up to 174 of these species (87 birds, 13 fish, seven amphibians, ten reptiles, and 57 mammals) could potentially breed within the project study area.

Table 3.15-1 lists the special-status species in the regional and project study areas. Of the 31 special-status species listed in Table 3.15-1, only 20 species occur or could occur in the project and regional study area including one plant, two fish, 11 birds, three bats, two amphibians, and one fox. These, are classified as special-status species or species that are protected by one or more state or federal environmental laws.

The proposed project alignment crosses a complex of wetland and upland habitats that include the following:

- Wetland/Riparian Habitats: Open water, riparian, and emergent marsh.
- Upland Habitats: Pasture, cropland, scrub, upland, and developed (including urban landscaping).

The general distribution of these habitats in the project and regional study areas is illustrated in Figure 3.15-2. These habitats and the wildlife associated with each are described below.

Open Water: Open water habitat consists of inundated areas with no emergent vegetation. Within the project study area, the majority of open water includes the eastern edge of Provo Bay on Utah Lake and the Provo and Jordan Rivers.

Utah Lake: Utah Lake is a natural lake, but was developed as a storage reservoir in 1872 with the creation of a low dam at the Jordan River outflow. Utah Lake is a freshwater lake; however, because of the high evaporation rate of the lake, the lake tends to be slightly saline, eutrophic (i.e., contains a high level of nutrients), and turbid. It serves as a primary irrigation water supply for thousands of acres of farmland in Salt Lake County. Water levels are constantly adjusted to accommodate agricultural and local water district needs, sometimes resulting in substantial degradation of fish habitat, particularly for the June sucker (*Chasmistes liorus*), an endangered endemic species.

Nine fish species, 79 bird species, and two mammal species represent the vertebrate species potentially associated with open water habitats within the project study area (Table 3.15-1 and detailed in Section 3.15.2.1). Four special-status species (June sucker, leatherside chub, American White Pelican, and Bald Eagle) use or could potentially use open water habitat in the project study area. Other common birds associated with open water habitat include Pied-billed Grebe (*Podilymbus podiceps*), Double-crested Cormorant (*Phalacrocorax auritus*), White-faced Ibis (*Plegadis chihi)*, Great Blue Heron (*Ardea herodias)*, Osprey (*Pandion haliaetus)*, and Belted Kingfisher (*Ceryle alcyon*). These species depend largely on many of the food resources found in or around this habitat. Wintering waterfowl, such as Common Goldeneye (*Bucephala clangula*), and Bufflehead (*Bucephala albeola*), also use open water habitats extensively. Bald Eagle and Peregrine Falcon prey on the shorebirds and waterfowl that concentrate in these areas.

Riparian Habitat: Although limited in extent, riparian habitat in the project study area provides food and shelter for two amphibian, three reptiles, 119 birds, and 38 mammal species. Four special-status species (Bald Eagle, Northern Goshawk, Yellow-billed Cuckoo, and Townsend's big-eared bat) use or could potentially use riparian habitat in the project study area. Other species associated with this habitat include Swainson's Hawk (*Buteo swainsoni*), Solitary Sandpiper (*Tringa solitaria*), Willow Flycatcher (*Empidonax traillii*), Loggerhead Shrike (*Lanius ludovicianus*), Virginia's Warbler (*Vermivora virginiae*), and Brewer's Sparrow (*Spizella breweri*).

The riparian habitats throughout the regional study area provide foraging habitat for many species of migrating/summer visitant insectivores such as warblers, kinglets, sparrows, flycatchers, swallows, and several

species of bats. Although they are limited in size and abundance and are widely dispersed in the project study area, these habitat patches provide links within a long network of similar patches along the Wasatch Front, a principal migratory corridor for these species. Russian olive (*Elaeagnus angustifolius*) trees that occur in riparian habitats also provide forage and shelter for a variety of fruit-eating species, such as Bohemian and Cedar Waxwings (*Bombycilla garrulous and Bombycilla cedrorum*), Hermit Thrush (*Catharus guttatus*), and American Robin (*Turdus migratorius*), as well ground-foraging Ring-necked Pheasant (*Phasianus colchicus*) and California Quail (*Callipepla californica*). A total of 14 rodent species, 12 bat species, porcupine, red fox, raccoon, long-tailed weasel, striped and spotted skunks, and mule deer also use these riparian areas. All of the reptiles found in this habitat are snakes, which feed on the abundant rodents, fish, birds, amphibians, and various invertebrates in the area.

River / Stream Riparian Habitat: River/stream riparian habitat consists of stream channel and vegetated banks with woody overstory vegetation. Within the project study area, the majority of this habitat includes the Provo, Spanish Fork, American Fork River, Spring Creek, Jordan River, and Hobble Creek.

Provo River: The Provo River is one of the major tributaries to Utah Lake and is used for agriculture, drinking water, and recreation. Several reservoirs and diversions, including the Jordanelle Reservoir, Deer Creek Reservoir, and Olmsted and Murdock Diversions, alter stream flow within the Provo River. Water flows downstream toward the Jordanelle and Deer Creek Reservoirs, then through Orem and Provo, and ultimately into Utah Lake.

The Provo River historically provided abundant fish habitat. This habitat was impacted by the damming of many natural lake basins in the early 1900s for water storage, channelization and straightening of the Provo River, inundation of 5 stream miles because of the filling of Jordanelle Reservoir; diking in the 1950s, and widespread dewatering due to irrigation diversions.

The habitat in the lower portion of the Provo River, from Utah Lake to just upstream of the I-15 stream crossing, was assessed qualitatively on August 10, 2004. Riparian vegetation was present along the entire river segment. In many places, large woody debris and other sources of fish cover habitat were present in the river. There was minimal sinuosity in the channel. Several standpipes observed along the bank were introducing water into the Provo River from adjacent agricultural fields.

Spanish Fork River: In 1860, settlers began diverting the Spanish Fork River for irrigation. The Strawberry Reservoir, which was completed in 1908, regulated water flow in the river. The Spanish Fork River historically contained spawning habitat for June suckers. Observations of the river made on August 10, 2004, revealed a heavily channeled stream with abundant filamentous algae and some overhead canopy.

Hobble Creek: Hobble Creek flows into Utah Lake near the heavily vegetated "Camelot Forest." Hobble Creek is a perennial stream because of discharge from several springs in the upper watershed and irrigation water return to the creek. The confluence of Hobble Creek and Utah Lake includes extensive marsh habitat. When the reach of Hobble Creek within the project study area was observed on August 11, 2004, the creek channel substrate was sandy, with minimal established habitat structure (e.g., rocks, vegetation), and the only fish species observed were mosquitofish (*Gambusia* sp.) and common carp.

American Fork River: Flow was extremely low at the time of the field assessment, and the streambed consisted mostly of gravel, with filamentous algae covering the channel bottom. No live fishes were observed within the river, but many dead common carp were observed at the confluence of the river and Utah Lake. The riverbanks in this area were largely covered by riprap. Farther upstream, the river water was impounded on private property. At this location, there was substantial riparian vegetation overhanging the creek, providing cover for fish.

Spring Creek: Spring Creek is the outlet of Mill Pond in American Fork and eventually flows into Utah Lake.

Jordan River: The Jordan River meanders for approximately 58 river miles from the outlet of Utah Lake north to the Great Salt Lake. Land uses adjacent to the river include agriculture, industrial, and residential uses. The Jordan River was historically a natural, meandering river corridor that provided abundant fish habitat, but it has been altered by development, including industrial and municipal waste discharges; encroachment of industrial, commercial, and residential activities on its floodplain; dredging and channeling; extensive water diversions and manipulations; and

urban runoff. The Jordan River has been listed as an impaired water that does not meet Class 3B (warm-water species of game fish) or Class 3C (non-game fish) standards under the Clean Water Act because of low dissolved oxygen and high ammonia, chlorine, pathogens, pH, turbidity, and total toxicity.

The earliest dam along the Jordan River was constructed in 1859. Today, there are two major dams—Turner Dam at the Jordan Narrows and Joint Dam about 1 mile downstream from Turner Dam—that divert water into the Jordan, Salt Lake, and South Jordan Canals. The Turner Dam diverts water to the East Jordan Canal and Utah and Salt Lake Canal.

Two habitat enhancement projects are located along the Jordan River within the regional study area. The Migratory Bird Habitat Restoration Project between 9800 South and 12100 South along the east side of the river is managed by the Utah Reclamation Mitigation and Conservation Commission (URMCC), in conjunction with Great Salt Lake Audubon Society and Tree-Utah. URMCC also manages the 81-acre I-15 Wetland Mitigation Site and Wildlife Preservation Area south of 12300 South, also on the east side of the river.

A site visit of the Jordan River was conducted on August 9, 2004. The portion of river assessed qualitatively appeared channeled, with sandy, silty substrate and abundant filamentous algae. The banks were covered with riparian vegetation that included olive trees, cottonwood, and saltcedar (*Tamarix ramosissima*) on the west side of the channel and emergent aquatic vegetation along the east bank. The river bank was supported by riprap in various locations. Mosquitofish were observed during the site visit.

Emergent Marsh: Emergent marsh provides suitable habitat for fish, amphibians, reptiles, birds, and mammals. American Bittern (*Botaurus lentiginosus*) and masked shrew (*Sorex cinereus)* are the only species considered to be exclusively associated with this habitat. Other common species that use this habitat include Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), Gadwall (*Anas strepera*), American Coot (*Fulica americana*), Song Sparrow (*Melospiza melodia*), and Red-winged Blackbird (*Agelaius phoeniceus*). Three special-status bird species (American White Pelican, Bald Eagle, and Short-eared Owl) and three special-status bat species (Townsend's big-eared bat [*Plecotus townsendii*], spotted bat [*Euderma maculatum*] and fringed myotis [*Myotis thysanodes*]) use or could potentially use emergent marsh in the project study area as foraging habitat. Fish in these marshes, particularly common carp, provide food for numerous fish-eating bird species, including Great Blue Heron, Snowy and Great Egret (*Egretta thula and Ardea alba*), American White Pelican, Double-crested Cormorant, California Gull (*Larus californicus*), and Forster's Tern (*Sterna forsteri*).

An abundance of aquatic and terrestrial insects produced in emergent marshes provides food for a broad diversity of insectivorous birds, including swallows, swifts, flycatchers, warblers, sparrows, and blackbirds, as well as several species of bats. The shallow waters of the marshes provide suitable habitat for amphibian species that are represented in the project study area. Amphibians and reptiles common to emergent marshes of the project study area are also comparably common in other well-watered habitats such as irrigated pastures. Common mammals in this habitat include voles, muskrat, and raccoon.

Pasture: Agricultural pasture is potentially used by a diverse assemblage of wildlife. Eight special-status species (Bald Eagle, Ferruginous Hawk, Burrowing Owl, Short-eared Owl, Bobolink, spotted bat, fringed myotis, and Townsend's big-eared bat) use or could potentially use this foraging habitat within the project study area. Pastures are dry at times, but flood irrigation of the fields provides rich foraging habitat for species such as White-faced Ibis, Franklin's Gull (*Larus pipixcan*), and California Gull. Bald Eagles prey and scavenge on some of the larger bird species that use this habitat (Buehler 2000). Common rodents (e.g., voles and ground squirrels) and lagomorphs (rabbits and hares) provide prey for many raptors, including Red-tailed Hawk (*Buteo jamaicensis*), Swainson's Hawk, Rough-legged Hawk (*Buteo lagopus*), Golden Eagle, and Short-eared Owl.

Cropland: Large tracts of cropland are located within the project study area (Figure 3.15-2). Because of the active rotation of crops, much of the cropland habitat is disturbed regularly, providing limited habitat availability for wildlife species that occur there. Most species use these lands when the fields are fallow, but some find food and shelter in or along the periphery of planted cropland. Four special-status species (Ferruginous Hawk, Burrowing Owl, Short-eared Owl, and Bobolink) use or could potentially use this foraging habitat within the project study area. Ground-

nesting birds (Ring-necked Pheasant, California Quail, Killdeer [*Charadrius vociferous*], Canada Goose, Northern Harrier, Short-eared Owl, and Western Meadowlark) commonly forage in planted fields but nest in non-crop vegetation or fallow crop fields around their periphery. Meadow voles, gophers, ground squirrels, and rabbits occurring in these peripheral habitats are prey for a variety of raptors, foxes, coyotes, and gopher snakes. Waterfowl, including Canada Goose, Snow Goose, Mallard, Northern Pintail, and American Wigeon, regularly forage in fallow cropland.

Scrub: Where limited disturbance has occurred, scrub habitat provides suitable nesting and foraging resources for wildlife. Scrub is the only habitat within the project study area that is likely to support populations of sagebrush and side-blotched lizards. A total of seven special-status species (Bald Eagle, Ferruginous Hawk, Burrowing Owl, Short-eared Owl, spotted bat, fringed myotis, and Townsend's big-eared bat) use or could potentially use this foraging habitat within the project study area. Many migratory birds find shelter and food resources (insects, fruit, and seeds) in this habitat, including various warblers, swallows, and sparrows. Bald Eagles regularly prey and scavenge on some of the larger birds and small mammals that use this habitat (Buehler 2000). Characteristic mammals of the area include numerous desert-adapted rodents and carnivores (e.g., foxes, coyotes, bobcats, weasels, and badgers).

Developed Areas and Urban Landscaping: The vegetation at existing interchange, residential, commercial, and industrial areas of the project study area has been converted to urban landscaping. Some of this landscaping also exists in rural residential areas, including around houses and outbuildings. Artificial landscaping incorporates many nonnative and native trees, shrubs, and other vegetation. The urban landscaping in the project study area provides useable habitat for a variety of native and introduced migratory species. Much of the urban landscaping (i.e., lawns, shrubs, and trees) provides food and shelter resources for a variety of wildlife. Although the more-common wildlife species in developed areas are generally nonnative species (e.g., Rock Pigeon, House Sparrow, European Starling, house mouse, and black rat) or highly urbanized native species (e.g., Mourning Dove), many other native species find resources in the patchwork of vegetated urban areas. One special-status species, Yellow-billed Cuckoo, uses or could potentially use this habitat within the project study area. Most of the bird species are incidental migrant songbirds that may utilize the trees and shrubs in urban landscaping for foraging, roosting, and loafing. Barn Swallows and Cliff Swallows typically nest in large colonies in abandoned buildings and on bridges, often in developed areas. Mammals typical of developed areas include mice and rats that use buildings and landscape plants; opportunistic raccoons and muskrats that find generally marginal habitat in parks, preserves, and scattered woodlots; and wide-ranging predators such as red foxes, coyotes, and bobcats that negotiate the urban environment in search of prey using patches of remnant habitat. Because much of the native vegetation that formerly occurred in developed areas is gone, the replacement urban shrubs and trees in housing areas and parks can provide food and roosting habitat for many species of migratory and resident wildlife.

3.15.3 Impacts on Wildlife and Wildlife Habitats

The existing habitat conditions of the project and regional study areas are used as baseline conditions for analysis of direct, indirect and cumulative impacts. Potential impacts on wildlife habitat resulting from implementation of the project could include habitat loss and habitat degradation. Any changes in habitat conditions that would potentially affect the status of the special-status species covered in this section were evaluated as potential impacts.

The impact of habitat loss was assessed by evaluating the relative amount of wildlife habitat that would be lost because of construction and operation of the project, what species could potentially utilize that habitat, and whether the amount of habitat loss would substantially affect long-term regional species viability.

A qualitative map-based analysis was conducted to determine how wildlife habitat would change within the project and regional study areas with implementation of the alternatives, and how these changes could potentially affect species that use the habitats. Direct habitat loss that could occur as a result of highway construction was determined by overlaying the Alternative 4 limits of disturbance onto the wildlife habitat map and evaluating the approximate area of each habitat within those boundaries.

For the cumulative-effects analysis discussed in Section 3.19 of this chapter, an estimate of historic and present habitat availability was required. An estimated regional historic wetland/wildlife habitat map was developed based on soil characteristics of these habitats as identified in the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Specific criteria used for identifying soil polygons that are representative of these habitat types included soil type descriptors such as those supporting "the habitat element shallow water," "habitat requirements for wetland wildlife," or "the wildlife habitat element for wetland plants." A soil class needed to be "good" for any of the categories to be included in the final dataset used to develop the estimated habitat availability. These data indicate that approximately 17% of the historic habitat remains in the Utah Lake Hydrologic Unit, and 33% remains in the Jordan River Hydrologic Unit.

3.15.3.1 Alternative 1: No Build

Under the No Build Alternative, conditions would stay as they are for both special-status and common wildlife and plant species.

3.15.3.2 Alternative 4: I-15 Widening and Reconstruction

Based on the available information on species occurrences, status, and available habitat, as well as the project description and footprint, the following potential impacts that could occur with implementation of this alternative were analyzed. Direct mortality of sedentary or less mobile wildlife species may result from project construction activities such as excavation, grading, and general equipment traffic. Incidental migrants, including sensitive species, may occur in the area; however, the high level of existing disturbance along the I-15 Corridor and the added disturbance of construction would be likely to result in heightened avoidance of the area by these species. Therefore, it is unlikely that direct mortality of any special-status species would occur.

Alternative 4 would result in direct loss of wildlife habitat in the project right-of-way. Habitat losses would be caused by such activities as excavation, grading, highway construction, and development and use of staging and access areas. The extent and character of these losses would be a function of the location of the alignment within the matrix of habitats in the project study area. The largest amount of habitat loss in the project study area would be urban landscaped areas, followed in order by pasture, scrub, and cropland habitat. Urban landscaped areas provide the least valuable wildlife habitat in the study area. Additionally, Alternative 4 would directly affect small areas of open water, emergent marsh, and riparian habitat.

Because the proposed project is primarily within or immediately adjacent to the existing I-15 right-of-way, very little wildlife habitat fragmentation is likely to occur. The habitat fragmentation analysis involved visual examination of the wildlife habitat map with the footprint of the project overlain on the map and general assessment of the extent to which existing habitat polygons would be fragmented, reduced, or lost. The areas of increased fragmentation will occur primarily at the North Lehi Interchange and the American Fork Interchange, where roadway facilities will extend outward from the existing I-15 Corridor. The fragmentation effects of this alternative on local wildlife populations would be additive to existing levels of fragmentation and all reasonably foreseeable future fragmentation that is likely to occur in the area. Because the existing habitat in the project study area is already highly fragmented by a diversity of human activities (e.g., agriculture, fences, roads, urban development), the additional fragmentation effects that this alternative would have on wildlife would likely be minimal, but would be additive to the effects of direct habitat loss.

Construction of I-15 may increase distribution and spread of noxious weeds and other invasive plants into adjacent native vegetation communities thereby reducing overall wildlife habitat quality. However, implementation of mitigation measures identified in Section 3.13.5 would ensure that construction activities would not introduce or spread invasive species in the study area.

Water Quality

Implementation of Alternative 4 may result in increases in highway runoff contaminants. Section 3.12, *Water Resources*, lists the primary contaminants in the project study area and their sources. The primary contaminants are not the only contaminants present in highway runoff, but they are the contaminants of primary concern regarding effects on water quality. These contaminants reduce water quality and potentially affect wildlife in a variety of ways, including habitat degradation.

The drainage concept for Alternative 4 includes the containment and treatment of storm water. Storm water would be collected, enter detention basins, be treated using an approved BMP and be released into the watershed. Consistent with Utah Department of Water Quality requirements, detention basins would be designed for a minimum 30-minute holding time to allow for sediment to settle out. Detention basins would only contain water after a precipitation event and would be designed to drain.

Temporary indirect effects, such as habitat modification due to sedimentation, also have potential to occur during construction. If it is necessary to encroach on stream channels (including side channels), the placement of temporary cofferdams could temporarily increase sedimentation.

Urban Landscaping

The removal of existing vegetation on the I-15 right-of-way, plus the primarily commercial and residential landscaping from the additional right-of-way, would reduce the availability of roadside habitat for resident birds and small mammals. The landscape concept for the reconstructed I-15 would include low maintenance, low wildlife forage value plant materials.

Threatened, Endangered, and Other Special-Status Species

The principal potential effects on threatened, endangered, and special-status species could include direct loss of habitat. The effects on these species would be primarily related to the amount of direct, permanent habitat loss. Because of the existing high level of disturbance within the project study area and the corresponding reduced carrying capacity, the overall impact of these losses alone would not affect the long-term viability of any of these species in the region.

Table 3.15-2 summarizes the impact of Alternative 4 on these species. The following discussion provides information on how this alternative could affect habitats for species of concern, based on input received from USFWS and UDWR. The determinations were based on an evaluation of the known species habitat requirements and DWR / USFWS reported existing and historical population distributions, as referenced throughout this section. The intersection of suitable habitat and current/historical population distributions was utilized to determine the presence/absence of a particular species or its habitat within the project study area and the context/intensity of potential impacts. A Biological Assessment was completed for the June Sucker, and two-years' field surveys were completed for Ute Ladies'-tresses.

Federally Listed and Candidate Species

Two species listed as threatened or endangered under the ESA are known to occur or have the potential to occur within the project study area: Ute ladies'-tresses and June sucker. In addition, Yellow-billed Cuckoo, a candidate species under the ESA and the recently delisted Bald Eagle have the potential to occur within the project study area.

Ute Ladies'-tresses (Threatened): Ute ladies'-tresses have been reported from 14 locations in Utah County, including locations near the project vicinity in Lehi, American Fork, Springville, Spanish Fork, and Payson (Fertig et al. 2005; HDR 2007). These populations were reported to occur in wet meadows, usually in floodplains, between 4,490 and 5,460 feet in elevation. Wet meadows along the I-15 Corridor are potentially suitable habitat for this species. Under Alternative 4, up to 29.12 acres of wet meadow would be filled. Under the Preferred Alternative,

20.09 acres would be filled. Two project-level pedestrian presence/absence surveys of wet meadow habitat along the I-15 Corridor detected no Ute ladies'-tresses within the project study area. Therefore, Ute Ladies'-tresses are presumed to be absent from the study area, and this alternative would have no direct effects on individuals of the species. Loss of this habitat would be likely to result in minimal effect, but it would contribute to the continuing regional cumulative loss of habitat for this species.

June Sucker (Endangered): This alternative would involve construction that crosses the Provo River within USFWS-designated June sucker critical habitat. The June Sucker Recovery Plan (JSRP) (U.S. Fish and Wildlife Service 1999a) describes conservation measures and a strategy for recovery for this species that includes actions to recover and enhance the migration and spawning habitat of the species in the Provo River and to minimize impacts associated with competition and habitat modification from non-native species. This alternative would implement all necessary stream management best management practices (BMPs) that are consistent with the goals and objectives of the JSRP and would avoid impacts to the June sucker. Alternative 4 would not modify the Provo River channel; therefore, no direct impacts are anticipated to occur to individuals of this species or to their habitat during construction or subsequent operation of the project. Modification to the Provo River channel bank will be required above the ordinary high water mark, including removal of riparian vegetation; however, no direct impacts to June sucker habitat are anticipated. Temporary indirect effects, such as habitat modification due to sedimentation, have potential to occur during construction.

Coordination meetings between UDOT and USFWS were held on June 22, 2007 and July 27, 2007 regarding potential impacts to the June sucker. A BA has been prepared. The concurrence letter from the U.S. Fish and Wildlife Service is included in Appendix A.

Yellow-billed Cuckoos (Candidate): Yellow-billed Cuckoos are rare migrants in the regional study area; they have low potential to occur in the project study area because of limited suitable riparian breeding habitat. The species is known to occur in the regional study area. Accordingly, all remnant riparian habitats, including those available in the project study area, could potentially provide suitable habitat for Yellow-billed Cuckoos. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some limited suitable riparian habitat for this species near the highway corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal effect on foraging and breeding in the area, but it would contribute to the continuing regional cumulative loss of habitat for this species. As with other transient birds that use the regional and project study areas, it is unlikely that this loss of limited suitable habitat would affect the long-term viability of Yellow-billed Cuckoos in the region.

Bald Eagle (Delisted July 9, 2007): Bald Eagles are common winter visitors to the regional and project study areas and are regularly seen perching around Utah Lake or occasionally flying along the Jordan River. One active nest exists near the Jordan River north of Salt Lake City. This nest is not close to the project study area (more than 20 miles away), and any eagles nesting there would not be disturbed by this alternative. In areas where the highway is relatively close to the Provo River delta or the Jordan River north of Utah Lake, construction noise would not be significantly higher than existing highway and urban noise and therefore would not be likely to affect any incidental use of these areas by eagles. No direct effects on individuals of this species are anticipated to occur as a result of project implementation. Alternative 4 would result in direct loss of some potential foraging habitat (emergent marsh, pasture, and open water) for this species near the highway corridor. However, the existing disturbance from I-15 has deterred individual birds in the area from using much of this habitat. Loss of this habitat would be likely to result in minimal effects on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. As with other transient birds that use the regional and project study areas, it is unlikely that this loss of foraging habitat would affect the long-term viability of Bald Eagles in the region.

State of Utah Conservation Agreement Species (CAS)

Two of the four CASs listed in Table 3-15.1 are known to occur or have potential to occur within the project study area: Northern Goshawk and Columbia spotted frog.

Northern Goshawk: Northern Goshawks have not been observed in the project study area. However, some studies on seasonal movement and habitat use patterns suggest that the species could potentially forage in the regional area because it supports prey species (small birds and mammals). The few wintering individuals that may occur in this region range over a large area, foraging in a variety of grassland and shrub habitats. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some limited suitable grassland and shrub habitats for this species near the highway corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal effect on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. As with other transient birds that use the regional and project study areas, it is unlikely that this loss of limited suitable foraging habitat would affect the long-term viability of Northern Goshawks in the region.

Columbia Spotted Frog: Columbia spotted frog is believed to have occurred historically in the Spanish Fork River, Utah Lake, Provo River, and Jordan River. Surveys conducted in the early 1990s (Ross et al. 1993) showed that distribution of spotted frog along the Wasatch Front had declined notably. During the site visits, no spotted frogs were observed in the Jordan River, but extant populations were located near the Spanish Fork River (Holladay Springs), Utah Lake (near Mona), and Provo River (Heber Valley) (Perkins and Lentsch 1998). Although these drainages cross the project study area, none of the occurrence records for this species occur within the project study area. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some limited suitable open water habitat (emergent marsh and open water) for this species near the highway corridor. Loss of this habitat would likely result in minimal effect, but it would contribute to the continuing regional cumulative loss of habitat for this species. It is unlikely that this loss of limited suitable habitat would affect the long-term viability of Columbia spotted frogs in the region.

State of Utah Wildlife Species of Concern

Ferruginous Hawk: Ferruginous Hawks have not been observed in the project study area, but it could potentially occur in the project study area while moving in or through the regional study area. Suitable habitats in the project study area include wet meadow, pasture cropland, and scrub. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some foraging habitat for this species near the I-15 Corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal impact on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. As with other transient birds that use the regional and project study areas, it is unlikely that loss of foraging habitat would affect the long-term viability of Ferruginous Hawks in the region.

Long-billed Curlew: Although breeding Long-billed Curlews have not been observed in the project study area, occurrences of migrants have been documented (Jones & Stokes 2005). They may forage in wet meadow and areas within scrub habitat. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some foraging habitat for this species near the highway corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal effect on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. As with other transient shorebirds that use the regional and project study areas, it is unlikely that loss of foraging habitat would affect the long-term viability of Long-billed Curlews in the region.

Burrowing Owl: Suitable habitat for Burrowing Owls occurs in the project study area, including pasture, cropland, scrub, urban fields, and freeway right-of-way. Burrowing Owls nest in crevices and burrows, especially those excavated by fox and badgers. They breed and forage primarily in pasture, scrub, and cropland habitats (along edges), as well as on dikes and islands in water impoundments. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some Burrowing Owl habitat near the I-15 corridor. However, the existing disturbance from I-15 would likely deter

individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal effect on foraging in the area, but would contribute to the continuing regional cumulative loss of foraging habitat for this species. It is unlikely that loss of this habitat would affect the long-term viability of Burrowing Owls in the region.

Leatherside Chub: Leatherside chub historically occurred in the Provo River and American Fork River drainages, but has been extirpated from the Provo River. The I-15 Corridor crosses over the American Fork River. Construction activities could potentially impact the habitat quality of the river. However, stream management BMPs that will be implemented before and during construction will avoid any impacts to this habitat, and therefore no impacts to the leatherside chub are expected to occur.

Lewis's Woodpecker: Lewis's Woodpecker is an uncommon permanent resident in Utah, but has been functionally extirpated from much of its historical breeding range along the Wasatch Front. This species is a habitat specialist with primary breeding habitat in ponderosa pine and open riparian areas. Winter habitat includes open woodlands and lowland riparian areas. Construction of this alternative will remove some riparian habitat along the rivers and streams that are located in the project study area. This habitat loss and noise disturbance associated with construction and highway operation could potentially displace individual Lewis's Woodpeckers or pairs from the project study area. Loss of this habitat would likely result in minimal effect on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. It is unlikely that loss of foraging habitat would affect the long-term viability of Lewis's Woodpecker in the region.

American White Pelican: American White Pelicans are summer visitors to the regional study area. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some potential open water foraging habitat for this species near the highway corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. Loss of this habitat would likely result in minimal effect on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. As with other transient shorebirds that use the regional and project study areas, it is unlikely that loss of foraging habitat would affect the long-term viability of American White Pelicans in the region.

Short-eared Owl: Short-eared Owls are uncommon breeders in the project study area. In the project study area, they are likely to be found in emergent marsh, wet meadow, pasture, cropland, and scrub habitats. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some Short-eared Owl habitat near the highway corridor. However, the existing disturbance from I-15 is likely to deter individual birds in the area from using much of this habitat. The direct impacts of this alternative would affect less than 0.1% of the overall extent of these habitats in the regional study area (Jones & Stokes 2005). Loss of this habitat would likely result in minimal effects, but it would contribute to the continuing regional cumulative loss of habitat for this species. It is unlikely that this loss of habitat would affect the long-term viability of Short-eared Owls in the region.

Western (Boreal) Toad: Several western toad populations existed historically along the Wasatch Front near Salt Lake City and Provo. These populations were likely extirpated as a result of development (Utah Division of Wildlife Resources 2006). Western toad populations currently occur in only 10 Utah counties: Box Elder, Cache, Rich, Wasatch, Summit, Sevier, Piute, Wayne, Garfield, and Kane (Thompson and Chase 2001; Thompson et al. 2003). Because of this distribution, implementation of Alternative 4 is not expected to affect this species.

Bobolink: In Utah, Bobolinks occur in low abundance in isolated groups, primarily in the northern half of the state. They have occasionally been observed in agricultural fields north of Salt Lake City, but they have not been documented in the project or regional study areas. Because of this distribution and local occurrence status, implementation of Alternative 4 is not expected to affect this species.

Grasshopper Sparrows: In Utah, Grasshopper Sparrows are primarily limited to the native grasslands located in the northernmost region of the state. Although suitable habitat for this species occurs within the project and regional study areas, the species has not been documented in those areas. Because of this distribution and local occurrence status, implementation of Alternative 4 is not expected to affect this species.

Bats: Like most arid-land bats, Townsend's big-eared bat, fringed myotis, and spotted bats take their insect prey during flight. For this reason, these aerial foragers are not tied to any specific habitats in the regional or project study area. No direct impacts are anticipated to occur to individuals of this species as a result of project implementation. Alternative 4 would result in direct loss of some potential open water foraging habitat for this species near the highway corridor. Loss of this habitat would likely result in minimal effect on foraging in the area, but it would contribute to the continuing regional cumulative loss of foraging habitat for this species. It is unlikely that this loss of foraging habitat would affect the long-term viability of bat species in the region.

Kit Fox: Utah Lake is located on the northeastern edge of the known distribution of kit fox (Zevellof and Collett 1988). Within their range, kit foxes are found in desert and semi-arid areas with flat shrub or shrub-grass communities and little ground cover. Because there is limited suitable habitat along the Wasatch Mountains in the vicinity of the project study area, kit foxes are considered extremely rare and have a low probability of occurring. Because of this occurrence status and the existing level of disturbance associated with I-15, Alternative 4 is not likely to affect this species.

Table 3.15-2: Summary of Alternative 4 Impacts on Threatened, Endangered, and Other Special-Status Species

Species	Project Impact
Ute Ladies'-tresses	No direct effects to individuals of the species. Minimal direct effects to potential low quality habitat.
June Sucker	No direct effects to individuals or habitat are anticipated. Potential indirect effects may temporarily occur during construction. A BA has been prepared, and the concurrence letter is in Appendix A.
Bald Eagle*	No direct effects to individuals of the species. No direct or indirect effects to nesting habitat. Minimal direct effects to potential low quality foraging habitat at the Provo River.
Yellow-billed Cuckoo	No direct effects to individuals of the species. Minimal direct effects to potential low quality riparian habitat.
Northern Goshawk	No direct effects to individuals of the species. Minimal direct effects to potential low quality foraging habitat.
Columbia Spotted Frog	No direct effects to individuals of the species. Minimal direct effects to potential low quality riparian habitat.
Ferruginous Hawk	No direct effects to individuals of the species. Minimal direct effects to potential low quality foraging habitat.
Long-billed Curlew	No direct effects to individuals of the species. Minimal direct effects to potential low quality foraging habitat.
Burrowing Owl	No direct effects to individuals of the species. Minimal direct effects to potential low quality habitat.
Leatherside Chub	No effects likely due to planned stream management BMP implementation.
Lewis' Woodpecker	No direct effects to individuals of the species. Minimal direct effects to potential low quality riparian habitat.
American White Pelican	No direct effects to individuals of the species. Minimal direct effects to potential open water foraging habitat.

Table 3.15-2: Summary of Alternative 4 Impacts on
Threatened, Endangered, and Other Special-Status Species – continued

Species	Project Impact
Short-eared Owl	No direct effects to individuals of the species. Minimal direct effects to potential low quality habitat.
Western (Boreal) Toad	No effects likely.
Bobolink	No effects likely.
Grasshopper Sparrows	No effects likely.
Townsend's Big-Eared Bat	No direct effects to individuals of the species. Minimal direct effects to potential open water foraging habitat.
Fringed Myotis	No direct effects to individuals of the species. Minimal direct effects to potential open water foraging habitat.
Spotted Bat	No direct effects to individuals of the species. Minimal direct effects to potential open water foraging habitat.
Kit Fox	No direct effects to individuals of the species.

* USFWS published the removal of the Bald Eagle from the list of threatened and endangered species on July 9, 2007, in the Federal Register (72 FR 37346). USFWS will monitor the Bald Eagle population status for a minimum of 5 years after delisting, as required by the ESA. The Bald Eagle will continue to be protected under the MBTA and the BGEPA.

3.15.3.3 Comparison of Design Options

For Alternative 4, the impacts on wildlife and special status species, including their potential habitat, for Provo/Orem Option A are anticipated to be similar to Option B. These two options disturb more surface area adjacent to the existing I-15 as these options have a wider footprint to accommodate frontage roads. This wider footprint would disturb more roadside and urbanized wildlife habitat than Options C and D. The impacts on wildlife and special status species, and their potential habitat, for Provo/Orem Option C are anticipated to be similar to Option D.

The impacts on wildlife and special status species, including their potential habitat, for American Fork Main Street Interchange Options A, B, and C are anticipated to be similar.

The Preferred Alternative includes Option D in Provo/Orem and Option C in American Fork. Further details about the refinements made to the Preferred Alternative are located in Chapter 2.

3.15.4 Mitigation

The Preferred Alternative design components that will minimize or mitigate potential wildlife impacts include those listed below. BMPs and other mitigation measures used for federally listed species will limit potential impacts to other sensitive species as well. Avoidance, minimization, and mitigation measures will include the following:

- The landscape concept for the reconstructed I-15 will include low-maintenance, low-wildlife-forage-value plant materials to avoid attracting wildlife to the I-15 right-of-way;
- UDOT will coordinate with USFWS prior to construction to determine if updated presence/absence surveys of Ute ladies'-tresses are needed;

- As practical, UDOT will time tree and shrub removal to occur during the non-nesting season of migratory bird species (approximately September 1 – April 30). If this is not possible, UDOT will conduct preconstruction surveys to determine whether active nests are present; active nests found in the area should be left untouched until the young have fledged;
- Raptor nests within the range of disturbance of project activities (refer to the FWS *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* [2002]) will be surveyed prior to construction activity if the construction will occur during the nesting season. If an active raptor nest is identified, UDOT will coordinate with FWS and/or UDWR to determine appropriate buffer distances and duration given the species and nest location.
- If bridge reconstruction must occur during the swallow nesting period (approximately May to July), existing nests will be removed prior to nesting occurring, and deterrence devices (such as tarps, netting, or Bird-X gel) will be employed to deter nesting.
- Minimize removal of riparian vegetation, where possible. Replace vegetation along river corridors that are impacted by equipment or other construction activities with native riparian vegetation, where appropriate, rather than containerized stock.

June Sucker mitigation measures include the following:

- As practical, confine construction activities that could impact spawning June Sucker at the Provo River crossing, to the August 1 through March 31 time period. These months are outside the spawning period, and will largely avoid any potential for adverse impacts on June Sucker. Any construction at the river crossing during the spawning period will be coordinated with USFWS.
- If necessary to encroach on the stream channel of the Provo River, Hobble Creek, or Spanish Fork River, temporary cofferdams will be installed outside the spawning period (April 1 through July 31) to enclose all construction activities to prevent escape of polluting sediments, oils, etc. All activities will be limited to the work areas created by the cofferdams.
- Construction activities in the Provo River, Spanish Fork River and Hobble Creek will not encompass more than two consecutive spawning seasons.
- Construction activities that involve any disturbance to the river waters or associated drainages will attempt to avoid creation of isolated pools or stranding fish within microhabitats.
- Where isolated pools are formed, the Division of Wildlife Resources or qualified personnel approved by the USFWS will be contacted to seine and remove any entrapped June Sucker.
- The BMPs listed in Section 3.12, this appendix, and the Biological Assessment will also offer protection to the June Sucker.

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